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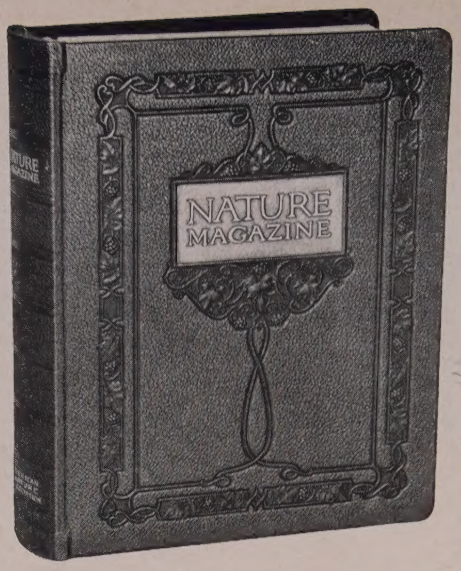

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What's on the Program Now?

What is the name of the gray-coated bird that you catch a glimpse of in the thicket over there? "*Zeay, Zeay,*" he whines, disagreeably, as if in protest at your intrusion, and goes off out of sight. Then from a distance comes an exquisitely finished, rippling song. Can it be possible that both sounds were made by the same bird? Only those who get to know the birds intimately by sight and sound realize the pleasure this intimacy can give.

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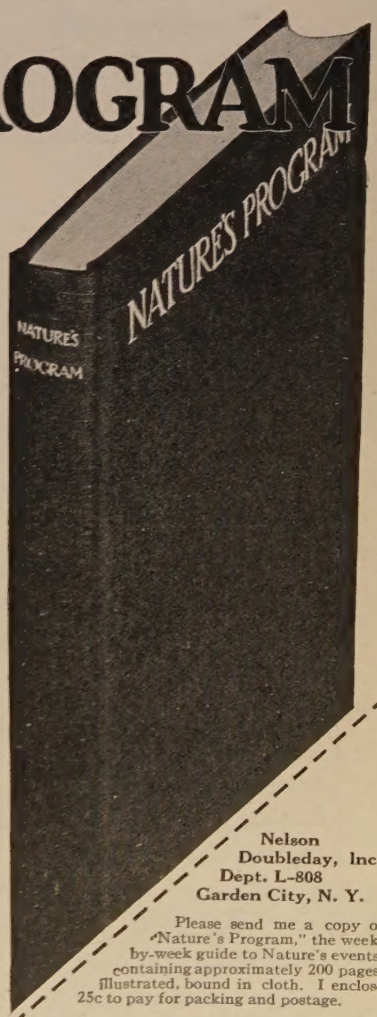

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"The Open Country"

"Jim" Borland is managing editor of the *News-Herald* of Franklin, Pennsylvania. He is also a lover of Nature. Being a writing man and having this Nature urge as well, it is only natural that his sentiments should be crystallized in verse as they have been in prose in his daily column in his newspaper. In an attractively printed little booklet and under the title of *"The Open Country and other Verses,"* Mr. Borland has gathered together a group of simple and straightforward little verses. The booklet was printed primarily for private distribution, although we find that a few copies are available at fifty cents each. In the last stanza of the opening verse, we think that Mr. Borland speaks for many of us when he writes:

And if I had my own way
About the running of things,
I'd say good-bye to the cities
And go where the whole world sings.
I'd live in a vine-clad cottage
Beside a clear running stream,
And have the birds for companions
And just be happy and dream.

Romance of Fungi

In this issue of NATURE MAGAZINE will be found an interesting article on fungi that are classed as our enemies. At the same time there comes to hand from the press of J. B. Lippincott Company of Philadelphia a fascinating book bearing the title *The Romance of the Fungus World.* Its authors are R. T. and F. W. Rolfe, both members of the British Mycological Society, and a

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commendatory foreword comes from the pen of J. Ramsbottom, mycologist to the British Museum of Natural History. The authors have tackled their subject with the aim of making it readable and understandable to the layman, and we should say that they have succeeded admirably.

In California's Pine

There is much to interest the Californian and to give him pause, as well as much food for thought for all Americans, in Department Bulletin 1402 of the United States Department of Agriculture. This is entitled *Timber Growing and Logging Practice in the California Pine Region* and is written by Stuart Bevier Show, California District Forester of the Forest Service. Col. William B. Greeley, Chief Forester, contributes an enlightening foreword in which he emphasizes the fact that reforestation has become an issue to be considered on a business basis and that our forest problem is no longer a theory to be discussed but an issue to be met quickly and with definiteness. Mr. Show contributes to this pamphlet out of his extensive and valuable experience as silviculturist of the Forest Service. Copies of the bulletin may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents.

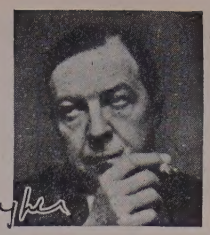
Bees and Sprays

Ever since fruit trees have been sprayed with arsenicals, beekeepers have been much interested in the effects of the practice on the mortality of honeybees. They have long felt that many bees were poisoned as a result of spraying, but until recently few systematic investigations have been conducted to determine whether or not honeybees are actually injured by these chemicals. In the hope of finding definite answers to some of the questions, so long debated, the entomologists of the United States Department of Agriculture planned and conducted a series of experiments, the results of which are discussed in Department Bulletin No. 1362-D, just issued, and a copy of the bulletin may be secured, as long as the supply lasts, by writing to the United States Department of Agriculture, Washington, D. C.

Battling Termites

Home owners who have detected the activities of termites or white ants around their property will find a helpful bulletin in Farmers' Bulletin No. 1472 of the United States Department of Agriculture entitled *Preventing Damage by Termites or White Ants.* This brochure is written by T. E. Snyder, entomologist, who has given long study to the activities of these destructive insects. Copies of the bulletin can be obtained for five cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

"Genius itself must learn the machinery of expression."



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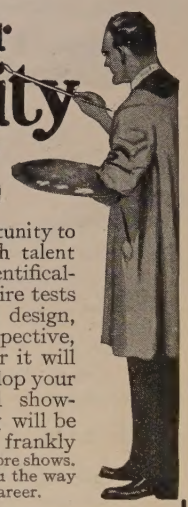

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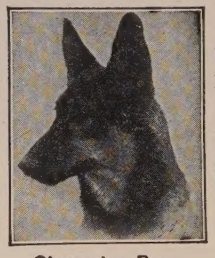

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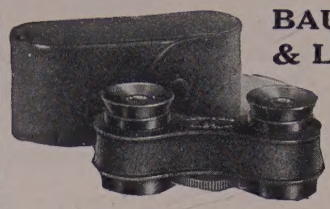
A Balanced Rock

Nature study is one of the main interests of the Community Hiking Club of Reading, Pa., writes Henry G. Stott, a member of the club. The hikers are always on the look-out for the unusual and one discovery is pictured here—a balanced rock on Capilla

Hill, some five miles from Reading. The rock is about fifty feet above the ground and it is estimated that its weight is between thirty-five and forty tons.

Incidentally, Mr. Stott says, the members of the Community Hiking Club are particularly interested in wild flowers but adhere to the slogan that these beauties are there to be seen but not to be picked.



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NATURE CALENDAR

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AUGUST

> "Hot mid-summer's petted crone,
> Sweet to me thy drowsy tone
> Tells of countless sunny hours,
> Long days, and solid banks of flowers;
> Of gulfs of sweetness without bound
> In Indian wildernesses found;
> Of Syrian peace, immortal leisure,
> Firmest cheer, and bird-like pleasure."
>
> *From "The Humble-Bee"*
> —By EMERSON.

Many birds are changing to their "going away" feathers. They are quiet and reclusive at this time.

Purple Martins begin to gather in ever-increasing numbers, roosting in tall trees at night.

August is an excellent month to look for meteors. Many of them are due. The Perseides look like yellow streaks of light radiating from the constellation Perseus.

August is the month of insect music. Locusts, grasshoppers, crickets and other insects seem to take possession of the out-of-doors with their humming and their buzzing.

Fawns are gradually losing the insignia of babyhood as their spots grow dimmer and dimmer. They follow closely at their mother's heels.

Many flowers droop and close as night comes on, but it is then that the evening primrose opens wide its petals for nocturnal moths and "millers."

Not even the hot August sun can abate the sweet melodies of the wood pewee.

Fern shooting galleries are now in operation. With a hand lens examine the tiny machine which catapults the spores.

Even this late tadpoles of the cricket frog are swimming in the waters.

The "kee-you kee-you" song of the red-shouldered hawk attracts the eye to this bird as it hangs high up in the sky, almost lost to sight.

Baby garter snakes are not hatched; they are born. Their first meal probably will be earthworms.

Ground pine is fruiting. It sheds yellow powdery spores in the wind.

Hummingbirds are frequent visitors at the nectar-filled flowers of the jewel-weed.

The spring peepers are singing again. You may find them catching insects in your garden.

Pickering's tree frogs are numerous in the woods and marshy lands. They are climbers and often are seen clinging to a tall stalk or limb.

The tree cricket is a musician par excellence. At night his rhythmic humming fills the air.

Ironweed, New England asters, joe-pye-weed, tansy and wild bergamot are common wayside flowers.

Bears are busy storing fat on their ribs. When winter comes they must have about four inches of fat and four of fur to carry them through until next spring.

The male scarlet tanager, now in mottled garb as he changes gradually from his summer coat of bright scarlet to one of yellowish green, in which he will pass the winter far to the south, seems more than ever a wanderer from the tropics.

Swarms of midges, like clouds and spirals of smoke, fly up and down in a sort of dance above the tree tops.

Goldenrod now begins to take a prominent place in Nature's wild gardens.

Woodcocks, always difficult to find because of their protective coloring, now become even more rarely seen. They hide in the dense thickets while moulting.

Although still in velvet, the antlers of the white-tailed deer have reached full growth.

Baby turtles are now hatching.

The club of jack-in-the-pulpit is studded with red berries.

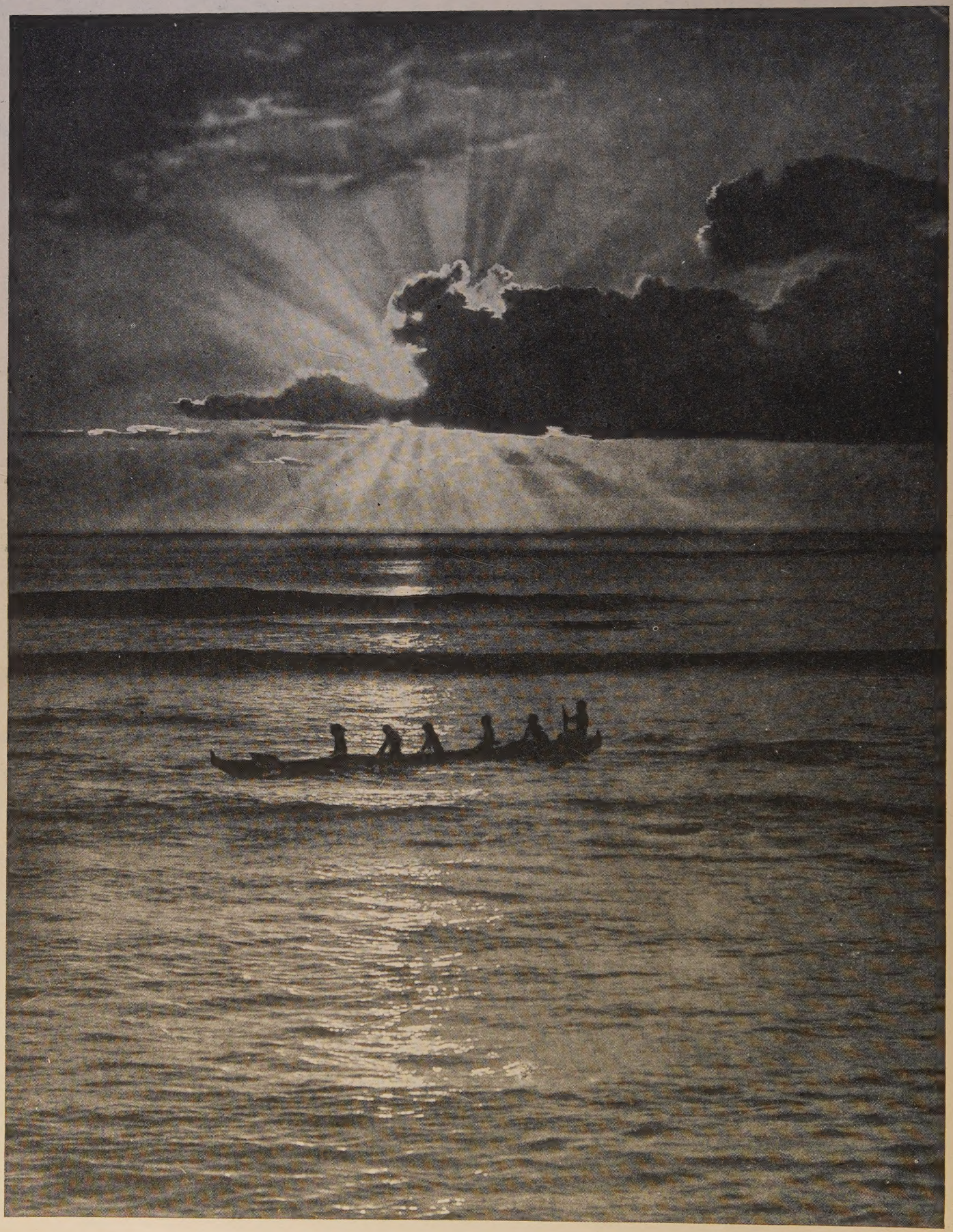
Skunks are good mousers. They also eat grasshoppers, crickets, locusts, and other insects. It is wise to befriend them.

The seeds along the tall spike of the common mullein are a delectable item on the menu of goldfinches.

Caterpillars of the green-clouded or troilus butterfly can be found feeding on the sassafras or spicebush. Soon they will make their cocoons.

The hawthorn is covered with bright scarlet fruits.

Prepared for NATURE MAGAZINE by the Cleveland Museum of Natural History



"THE ROPES OF MAUI"

COPYRIGHT, 1922, J. J. WILLIAMS

According to South Sea legend these beams of light are the snares of coconut fiber with which the hero Maui captured the sun.

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NATURE MAGAZINE

Vol. VIII AUGUST, 1926 No. 2

The sweet approach of even or morn.
—MILTON.

And, like a lobster boil'd, the morn
From black to red began to turn.
—BUTLER.

SUNRISE, SUNSET, DAWN AND TWILIGHT

By CHARLES FITZHUGH TALMAN
U. S. Weather Bureau

THE AVERAGE novelist can describe a dinner and not leave you uncertain whether the dessert came before the soup. He can describe an elephant—even if he has never seen one—and make no mistake about the relative locations of the beast's trunk and tail. When it comes, however, to dealing with those two favorite themes of romantic writers—sunrise and sunset—the novelist, essayist or poet who can furnish an accurate, circumstantial account of the successive appearances that everybody has seen, over and over again, in a clear sky at the beginning or the end of the day is a rare bird indeed. I am not sure that he is as prevalent as the phoenix.

Apparently most people, whether they belong to the literary fraternity or not, think of sunrise and sunset phenomena as a disorderly jumble of colors, which increase in brightness in the one case and diminish in the other, but which observe no definite rules as to sequence and location. This conception is erroneous. It is true that no two sunrises and no two sunsets are exactly alike, even from day to day in one locality; and there are striking differences dependent upon climate, altitude, season and other things; yet they all have enough in common to make possible a generalized description of what may be regarded as a normal sunrise and a normal sunset, and the order in which their various phases occur is so uniform that the attentive student soon learns to recognize each of these phases; all of which have been given distinctive names by the authorities on atmospheric optics.

If our earth had no atmosphere, there would be no "sweet approach of even or morn" for poets to write about. Daylight would begin abruptly when the sun appeared above the horizon, and be replaced by total darkness as soon as he sank below it. Morning and evening twilight are due to the reflection of sunlight shining upon the upper layers of air when the sun is too low to be visible from the earth's surface. The lower the sun the less dense is the air upon which the solar beams fall, and the less intense is the light reflected to earth. When the sun is not more than about six degrees below the horizon we get, in clear weather, enough daylight for ordinary outdoor occupations, and the short period before sunrise and after sunset during which this condition prevails is called "civil twilight." The total darkness of night ends in the morning and begins in the evening when the sun is about eighteen degrees below the horizon. The longer period of partial daylight between this time and sunrise or sunset is called "astronomical twilight."

The length of twilight depends upon weather, latitude and the time of year. Fair-weather astronomical twilight in the latitude of Philadelphia ranges in length from an hour and a

PHOTOGRAPH FROM THE OBSERVATORY OF THE EBRO

A SUNSET IN THE LAND OF VELASQUEZ

The camera sometimes beats the brush in recording a fine sunset. This photograph was taken at Tortosa, Spain, August 13, 1908, at six p. m.

half about the middle of October and the first of March to two hours at the summer solstice. In higher latitudes the twilights are longer. North of about the forty-ninth parallel there is a period in summer when twilight lasts all night. The tourist who makes the classic cruise to North Cape sees "the midsummer midnight Norway sun set into sunrise," thus crowding twilight out of the day's program altogether for a small portion of the year, while far within the polar regions there are twilights lasting several weeks. At the equator, twilight, at sea level, is a little more than an hour long and does not vary much in length with season. At high levels within the tropics the twilights become very brief, owing to the small amount of reflecting air above the observer's level. At Quito and Lima they are described as lasting not more than twenty minutes.

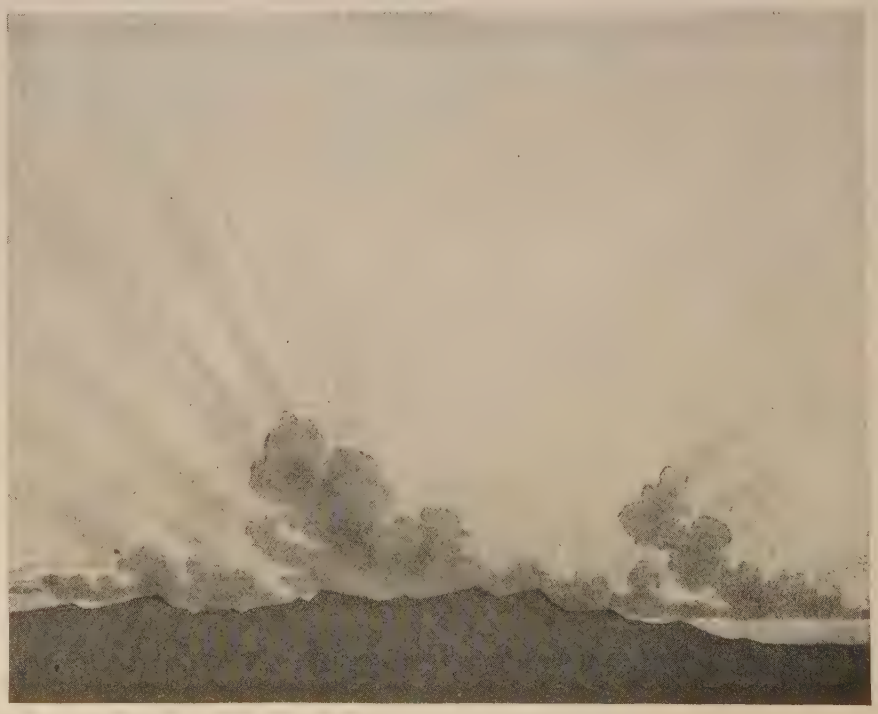
PHOTOGRAPH FROM NATIONAL PARK SERVICE

THE MIDNIGHT SUN ACROSS THE YUKON FLATS, ALASKA

In the far north there is neither darkness nor twilight in midsummer, and one sees the sun "set into sunrise."

The earliest careful studies of twilight duration were made by the Arabian astronomers, and there was a special reason why they were interested in this matter. The Moslem religion prescribes daybreak—the beginning of dawn, or morning twilight—as one of the five daily hours of prayer. Moreover, during one month in the year a strict fast is observed from this time to sunset. Hence as far back as the eleventh century the time of daybreak at various seasons of the year had been determined with considerable accuracy. The same authorities distinguished between true dawn and an earlier faint illumination of the eastern sky known as "false dawn," frequently mentioned in the literature of the Orient. The line in the Rubáiyát "Before the phantom of false morning died" refers to this phenomenon. It is the zodiacal light, supposed to be due to sunlight reflected from fine particles of matter entirely outside the earth's atmosphere. It is best seen in low latitudes; especially in the pure air of tropical and subtropical deserts. In the United States it is visible at certain times of the year, but not where city lights prevail.

We now come to the succession of light and color effects occurring before sunrise and, in inverse order and position, after sunset. For the sake of simplicity we shall consider only the evening phenomena. After the sun has sunk out of sight, a broad band of golden light is seen along the western horizon. This is called the "bright segment." Above it, in the western sky, appears a more or less circular area of rosy glow, known as the "purple light." In the eastern heavens, after sunset, there rises steadily from the horizon the so-called "dark segment," which is the blue or ashy shadow of the earth on the sky. This is bordered above by the pink or purplish "anti-twilight arch." As time goes on the purple light in the west, after increasing in brightness for a while, sinks behind the bright segment; while in the east the rising dark segment encroaches upon and finally obliterates the anti-twilight arch. Sometimes, in very clear weather, there is a complete repetition of these lights and colors, though they are all much fainter in this "second twilight" than in the first one.



DRAWING BY DR. ALBERT HEIM

CREPUSCULAR RAYS AFTER SUNSET

These solar beams often show exquisitely beautiful contrasts of pink and blue. Sometimes they extend clear across the sky.

The various stages of sunset just described are subject to a good many modifications, dependent upon weather and the purity of the atmosphere. Sometimes the western sky is greenish rather than yellow or purple, and again it may show a lurid red hue, which in the tropics often betokens the arrival of the cloud veil, spreading out from an approaching hurricane, while in any latitude it may be due

to an excessive amount of fine dust in the atmosphere. The most remarkable of these fiery skies were seen over much of the world for two or three years after the great volcanic eruption in the island of Krakatoa in 1883, and were caused by dust from the volcano. In one American town the glow above the horizon was once so vivid that the local fire brigade turned out to extinguish what was supposed to be a big fire in a neighboring village!

No feature of a sunset or sunrise sky is more beautiful than the fan-like rays sometimes seen crossing the rosy glow above the horizon where the sun has set or has not yet risen. The reddish beams alternate with beams of blue or gray; the latter being the shadows cast by distant clouds, or sometimes mountains, lying in the direction of the sun. These beams, which are known as "crepuscular rays," appear to converge toward the position of the sun below the horizon, but are really parallel, the apparent convergence being the effect of perspective. I wonder whether the pedagogues who annotate school editions of the classics have yet discovered that this phenomenon gave rise to the familiar Homeric expression, "rosy-fingered dawn"? They had not when I read the Iliad in college.

On rare occasions crepuscular rays can be seen extending entirely across the sky and converging toward a point directly opposite the sun. Similar beams, devoid of color, are often seen radiating from the sun when above the horizon and partly obscured by clouds. The bright beams are made visible by the presence of dust or haze in the atmosphere, while the intervening dark spaces are cloud shadows. When the beams extend downward, the appearance is popularly described as "the sun drawing water," though no such process actually takes place. Sailors sometimes call the beams "the backstays of the sun," while in the folklore of Polynesia they figure as "the ropes of Maui," in allusion to the story of how the great hero of South Sea isle mythology once captured the sun with snares of coconut fiber. In parts of rural England the beams are known as "Jacob's ladder."

Among snow-capped mountains sunrise and sunset phenomena assume a particularly beautiful form which is known as the "Alpenglow," because most descriptions of it relate to the Alps, and especially to its appearance on the huge snowy mass of Mont Blanc. In fine weather, just before sunset, the peaks to the eastward begin to show a reddish or golden hue. This fades gradually, but in a few minutes, when the sun is a little below the horizon of the observer but the peaks themselves are still bathed in direct sunlight, an intense red glow, beginning down the slopes, moves upward to the summits. This is identical with the anti-twilight arch, which we have mentioned in describing the stages of sunset. Presently this glow is succeeded by an ashy tint, as the peaks are immersed in the rising dark segment of the earth's shadow. Their rocks and snows assume a livid

PHOTOGRAPH BY COL. STUART WORTLEY

"THE SUN IS RISING O'ER THE SEA"

When the day breaks above a bank of cloud it is said to be a "high dawn." Daybreak over a clear horizon is described as a "low dawn."

appearance, aptly described by Swiss observers as the *teinte cadavéreuse* ("corpse-like hue"). In ordinary weather darkness succeeds without any further notable phenomena, but occasionally there occurs a remarkable renewal of rosy light upon the peaks, known as the "recoloration" or "afterglow." At Chamonix this is termed the "resurrection of Mont Blanc." Sometimes this glow lasts until an hour after sunset, and it passes away from below upward. On very rare occasions there is a second afterglow. Similar phenomena are seen in reverse order in the morning, though less often than at sunset.

PHOTOGRAPH BY P. E. BUDLONG

NO, THE SUN IS NOT REALLY "DRAWING WATER"

These rays are merely sunbeams coming through breaks in the clouds and lighting up haze in the air.

One of the well-known effects of atmospheric refraction is to elevate the apparent position of celestial bodies when near the horizon. The amount of such elevation is about equal to the apparent diameter of the sun's disk. Hence the paradox that, with a clear horizon, we can see the sun before it rises and after it sets. The refraction is, moreover, greater on the lower side of the disk than on the upper, so that normally the sun assumes an oval form, much flattened below, at its rising and setting. Apart from these ordinary phenomena, the solar image seen close to the horizon is sometimes distorted into various strange forms by a mirage effect, due to the passage of the light through layers of air of different densities. It may then assume the shape of a boy's top, a soldier's trench helmet, a mushroom, etc., or even divide into two separate much flattened suns. Many descriptions and drawings of these curious solar images have been published, from the sixteenth century onward, and a remarkable collection of photographs of the phenomenon, taken from the summit of Mount Hamilton, California, appears in a publication of the Lick Observatory.

Just at the instant when the upper edge of the sun is about to sink below a distant well-defined horizon, such as that of the ocean, its color often changes to a brilliant green, sometimes blending into blue. The same color is frequently seen when the edge of the solar image appears above the eastern horizon in the morning. This transient phenomenon is known as the "green flash." The ancient Egyptians are said to have been familiar with this appearance, and hence to have assigned the colors green and blue to their semi-circular symbol of the rising or setting sun. It is explained as an effect of "dispersion"; i.e., the separation of the prismatic colors by different degrees of refraction. The greens and blues in the solar light are bent a little farther upward than the reds and yellows; thus they disappear last at sunset and appear first at sunrise. When more than a slender rim of the sun is visible, rays coming from different parts of the disk blend in such a way that no separation of colors is noticeable. Nature beats all the story books in the great diversity and supreme beauty of her skies.

"SIN SINGING"

The forewing serves as violin and the leg as bow.

THE COMMON FIELD CRICKET

His song should be familiar to all, that monotonous repetition of the syllable "cri," from which it derives its name.

IN CLOVER

Here is a short-horn grasshopper, violinist extraordinary.

OUR MIDSUMMER ORCHESTRA

By L. W. Brownell

(ILLUSTRATIONS BY THE AUTHOR)

MIDSUMMER is with us, and with it Nature has changed the tempo of her musical activities. The joys and duties of spring completed, new families reared or still demanding attention, the lilting bird choir has quieted. Its place upon the stage is taken by another act. It is replaced by a new company of musicians—instrumentalists all. This is the insect orchestra, and right well do they take their part in Nature's concert. What a whirring, vibrant chorus they make over the fields and meadows, and what a fitting accompaniment to the long, hot, sultry days of late summer and early fall! It is an accompaniment that is frequently sensed rather than actually heard. So gradually has it increased in volume and become so a part of the heat and sultriness that we only fully realize it is there when, for some reason or other, it is suddenly stilled and we stop to wonder what has happened.

The members of this orchestra are well called instrumentalists. The birds are true vocalists, producing their song by means of a vocal chord, but there is no insect that possesses vocal organs. The members of this tremendous orchestra are mostly from three families of the great order Orthoptera: the short-horned grasshoppers, or true locusts (*Acrididae*); the long-horned grasshoppers (*Locustidae*); and the crickets (*Gryllidae*).

The "song" of these insects, as we loosely call it, is produced by rubbing or beating some portion of the body against some other portion. Nature has so modified these as exactly to fit them for the service they are expected to perform. With the crickets the sound is produced by rubbing or rapidly vibrating the upper pair of wings against the lower pair. Some of the grasshoppers we might speak of as almost true violinists, their forewing constituting the violin and a leg the bow. The latter is so veined and grooved as somewhat to resemble a minute file, and, by placing this against the edge of the former and rubbing it up and down with greater or less rapidity, various degrees and kinds of "music" are produced by the several species.

ONE OF THE INSTRUMENTALISTS

Here is one of the locust members of the midsummer orchestra that is now tuning up.

Members of the order Orthoptera are to be found in greater or less numbers in almost every conceivable spot throughout the world. One cannot walk abroad through the summer fields without finding them by the thousands. They are, perhaps, most numerous in the meadows where the grass is lush and deep, but many of them may be found sunning themselves in dusty or sandy spots, and certain species are almost entirely tree-living in their habits.

The family *Locustidae* includes some of the Kreislers and Elmans of insectdom. There are the green grasshoppers, among whom the musical ability is confined to the males. The apparatus by which the music is produced is composed of a curiously developed membrane situated at the base of the wing covers. These are the aspiring soloists of this insect orchestra, and their "songs" may frequently be heard, as in the case of the katydid, for a considerable distance.

During the day, we who tramp the fields in August may hear at almost any time, rising high and clear above the burr of the myriad other insect sounds, a certain familiar strain. "Tzip-tzip-tzip-tzip-tzee-e-e-e-e-e-e-e" the sound reaches us from a point seemingly only a few feet away. We seek the author. As we move toward the sound, it seems to ad-

A MIDSUMMER DUET
A tree cricket above and a young grasshopper below.

vance in front of us. We find that we have covered a number of rods, instead of a few yards, before we can be sure that we are at last within a few feet of the "singer." We have no sooner arrived, however, than the "song" suddenly ceases, and, search as we may, we can find not the least sign of any insect large enough to have made the sound which we have been following.

TWO OF THE KATYDIDS
They labor under the Latin names of *Amblycorypha rotundifolia* and *Pterophylla camellifolia*.

The very best thing that we can possibly do, if we really wish to see him, is to sit quietly on the ground and wait for him to recommence his "song." It will probably be but a few minutes before the "tzip-tzip" will start up again, this time close to our ears. We will surely find the performer if we quietly search the grass stems and heads in the direction from which the sound comes. There he sits, astride a head of timothy, in color so nearly matching that of his perch that it is little wonder that we did not sooner find him.

He is about an inch in length with transparent wings, through which the outline of his bright green body can easily be seen. His legs are long and fragile looking. One wonders what keeps them from breaking when he alights from one of his long and, seemingly, reckless jumps. This is the common meadow grasshopper, *Orchelimum vulgare*. Let us watch him closely for his musical technique. At the base of the wings, directly back of the thorax, there is a small glassy spot. This is his tambourine, and even as we are watching he commences a performance. His wings vibrate so rapidly as to appear indistinct. By a few convulsive movements, he beats or scratches on this glass-like spot, producing the strain we had sought. His is

ONE OF THE KATYDIDS
These little fellows "play" during the day as well as at night.

MA AND PA KATYDID
Mother, above, is busy at her duty of laying eggs.

CAROLINA LOCUST
This fellow is a distinct menace in the South.

TWO STAGES OF SHORT-HORNS
Above there is a youngster without wings and below are two adults.

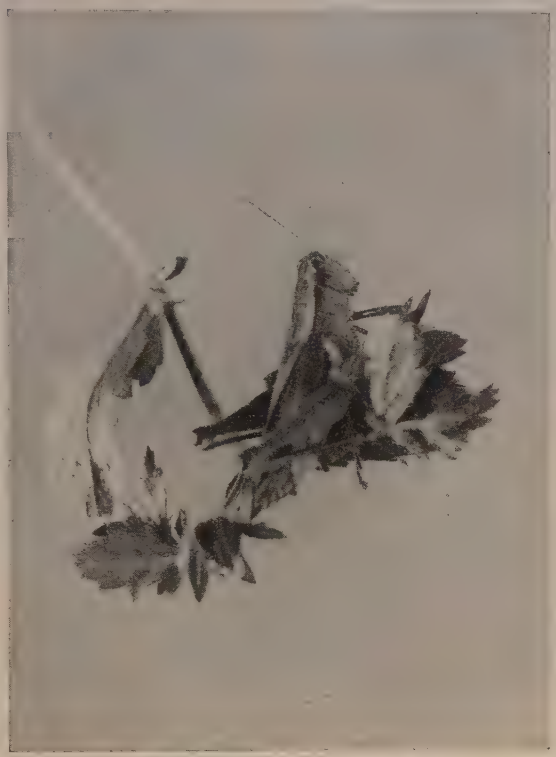
three notes of the meadow grasshopper repeated endlessly. "Zip-zip-zip-zip-zip-zip-zip" it goes in a continuous string of sound, always with an implied promise of something better to come but never reaching beyond the prelude. The author is a comical looking fellow, the clown of the minstrel troupe of grasshoppers. He is long and thin, with a pointed head and narrow wings nearly twice the length of his body. He is a shade of green that so nearly matches the grass and weeds among which he is at home as to make it almost impossible to find him.

Another member of the long-horn family with whose "song," at least, we should all be reasonably familiar, and from which he has taken his name, is the katydid. There are several species of this family that are all called by this name from the similarity of their songs. These little fellows are day as well as night singers, but it is the night "song" which we know the best. The true katydid, *Pterophylla camellifolia,* makes its music in much the same manner as does the meadow grasshopper and more often gives two notes than three, saying simply "Katy" or "she did" rather than the full "Katydid." When we consider their size and the volume and carrying power of their notes, we realize what an enormous strength these little insects must possess in order to enable them to produce their song so continuously and for such a length of time without becoming completely exhausted. These katydids are almost entirely tree-living, and it is seldom that we hear one singing near the ground. Moreover, they seem to prefer a considerable height and are usually heard well up in the tops of the trees.

There is another insect "voice" which comes to us in the late summer and autumn evenings, one which seems to be the most omnipresent "voice" of the entire winged chorus.

Another singer of the meadows whose instrument cannot be missed among the innumerable other sounds, for its harsh, grating, file-like tone is the cone-headed grasshopper, *Conocephalus ensiger*. His "song" is a poor imitation of the first part of the soft stillness of a September night. "Ter-reek, ter-reek, ter-reek, ter-reek, ter-reek." We hear it on every side, coming from the mysterious darkness of the shrubbery, and are wont to ascribe it to the common cricket. But we are wrong, for the cricket delivers his performance from no higher perch than a stone. The notes are, too, of a more delicate and refined quality than are those of the cricket. The "song" is sometimes heard as an absolute solo but more often as a continuous, united chorus that forms an underlying cadence to the other sounds of the night. It has a pulsating, rhythmical beat that is peculiar to it alone. Hawthorne speaks of it as an "audible stillness," and says that if "moonlight could be heard it would sound like that." Thoreau called it "slumbrous breathing." There seems to be a quality about the monotonous persistence of the "song" which pervades our beings without our being entirely aware of the presence of any sound. When, as sometimes happens, however, it suddenly ceases, it leaves a complete blank that immediately causes us to wonder what has happened. The performer is as delicate and ethereal as is his note. Less than an inch in length, with a pale green body, white diaphanous wings, and legs long and extremely fragile, the snowy tree cricket, *Oecanthus niveus,* appears almost too frail a thing for this earth. Yet he survives them all, and his cheerful little "song" may be heard late in the fall after nearly every other insect voice has been stilled.

A close relative of this little sprite is the broad-winged tree cricket, *Oecanthus latipennis*. He, however, is more essentially a day than a night singer and is of a somewhat more robust appearance than his night-loving relative. He is rarely to be seen in the act of producing his "song," for he is extremely diffident and does not care to perform before an audience. If one is lucky enough to catch a glimpse of him while he is performing, he cannot but admire his grace and beauty. His two wings are held aloft, perpendicularly, forming a miniature double lyre, and are vibrated so rapidly



THE RED-LEGGED LOCUST
This fellow is closely related to the destructive western locust.

LONG-HORN LOCUSTS
Male and female of these tuneful members of the orchestra.

that the eye can see nothing but their blurred, indistinct outline. In this manner is produced the high-pitched tune that often is prolonged for as much as ten or fifteen minutes without a pause.

These are but two of the family of crickets, which takes its name from the French popular name "cricri." The family may be separated into three distinct types: The true crickets, of which the field cricket is the commonest and most typical form; the tree crickets, to which group belong the two little fellows described; and the mole crickets, curious creatures that spend practically their entire existence underneath the ground in subterranean burrows. They are usually entirely wingless, or with rudimentary wings, and their front legs are modified into digging appliances with which they excavate their burrows.

The house cricket, the "cricket on the hearth" of song and story, *Gryllus domesticus,* is a native of Europe and only inhabits this country to any extent in Canada. The common field cricket, *Gryllus assimilis,* however, often finds his way into our houses, supposedly bringing good luck with him and carrying it away as surely as he is driven forth. His song should be familiar to all, the monotonous repetition of the syllable "cri."

The true locusts, the short-horned grasshoppers, are less musical than are their long-horned cousins, but they make up collectively for what they lack individually. While the sound made by a single locust is often lost among the multitudinous other sounds of Nature, thousands of them together, adding their mite to the general turmoil, are frequently almost deafening. In our eastern fields they are like the piano accompaniment to the solos of their more gifted relatives, making an underlying, sustained hum, indispensable to the summer orchestra.

Members of this family are common all over the world, with the exception of the far north. It includes some of the most destructive insects known. In some countries, especially Russia, portions of southern Europe and India, they have been known to settle upon the country in such enormous swarms as to destroy all vegetation and have died in such numbers as to cause a sickening, deadly stench to arise from the putrefying bodies.

In this country probably the most injurious species is the Western grasshopper, *Melanoplus spretus,* that damaged the crops in the states of Kansas, Colorado, Nebraska, and Missouri during the years 1874–76, to an extent of more than $200,000,000. In the east the most destructive species is the common red-legged locust, *Melanoplus femur-rubrum,* which closely resembles the foregoing but with shorter wings; the two-striped locust, *Melanoplus bivittatus,* a widespread form which is abundant every year; the Carolina locust, *Dissosteira carolina,* the common light brown species seen so frequently along dusty roads; the American locust, *Melanoplus differentialis,* a species that has played havoc among the cotton plantations.

The members of this family are the true violinists, making their music by raising and lowering the hind leg, causing the thigh to rub against the edge of the wing-cover.

The short-horns have very short antennae. The hind legs are stout and very much thickened at the base. By these two points of difference they may always be easily distinguished from their relatives, the long-horns. They nearly all make whirring sounds when in flight, and this appears to be completely under the control of the insect.

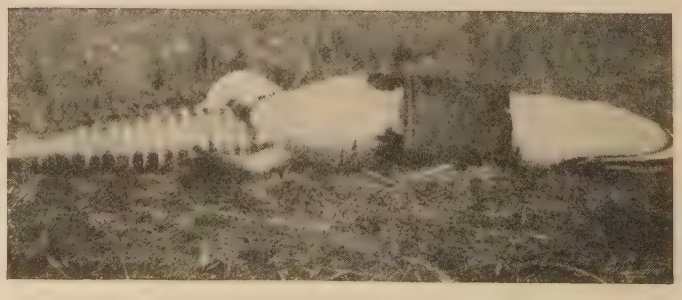
To this family belongs the little coral-wing, the first of the grasshoppers to make his appearance. Those who tramp the fields in the spring are sure to know him. He rises at our feet, darts, a rosy streak for a short distance, and disappears in the long grass as suddenly as he appeared. At other times he will rise to a height of two or three feet and there appear to hang motionless in the air, his wings moving so rapidly as to seem to be nothing more than a rosy gleam of light.

The Carolina grasshopper, mentioned already, is a very close relative of this little fellow but a later comer. He is a particular lover of the dusty roadsides. He is rather conspicuous when in flight owing to the yellow borders of his under wings, but he is immediately lost to view when he alights; for his wing-covers are a brownish-drab that almost exactly matches the tone of his dusty surroundings. During July and August he is plentiful along the country roads and throughout the dry fields.

Of course there are many hundred other members of the great midsummer insect orchestra than the more conspicuous ones of which I have made mention, and they all help to swell the chorus. Gradually this chorus diminishes in volume as one after another of its members drops out until, late in the fall, the last to remain are the frailest of them all, the little tree crickets. But the concert is memorable.

AN UNFORTUNATE SUICIDE

"OH, MIS' LILLIAN, come over and see the alligator. He has killed hisself." This startling news from a colored man caused Mrs. Lillian B. Albertson, of Orlando, Florida, to start an investigation. The alligator was found in the weeds off the shore, and around his body there was a lard pail, through the rusty bottom of which he had pushed his head while swimming. His front legs were closely pinioned to his body, and being unable to dissever himself from the cylinder, he had apparently existed a few days under difficulty. Then the beautiful specimen of five feet nine inches alligator flesh gave up the struggle and no longer frequented its haunts in the nearby waters.



Trapped in the embrace of an old bucket.

Courtship of Wild Ducks

By Joseph Dixon

(PHOTOGRAPHS BY THE AUTHOR)

A COUPLE OF LONELY BACHELORS

Even after the courting season is over there appear to be some drakes left out in the cold for some reason.

IN MANY species of our wild ducks the males are large and strikingly colored. In contrast their mates, upon whose shoulders fall nearly or quite all of the family cares of sitting on the eggs and caring for the young, are smaller and dressed in somber garb. The dun concealing colors of the female duck stand her in good stead since they serve to protect both her and her eggs from the prying eyes of enemies. The use of the brilliant plumage of the male ducks may be explained in various ways. One point is that the bright feathers of the drakes play a conspicuous part in the courtship of many species of ducks. The displaying by the drake of his striking plumage probably influences the female's choice of a mate, but to what extent is still open to question. The methods used by the males in displaying their charms vary in different species, and here we consider our most widely known species of wild ducks known as the Pintail or Sprig. This duck gets both its common name and its scientific name (*Anas acuta*) from the long, black, central tail feathers of the male.

ON THEIR HONEYMOON

A mated pair of pintails on their wedding journey paddle about the surface of their watery home.

In California, courtship may be noted among the Sprigs even before Christmas. The writer once saw a very ardent courtship one November day. In another case one particular female which, as far as could be seen, differed in no marked degree from hundreds of other females that swam about near her, was singled out and pursued constantly by from three to nine adult males. No peace or quiet was given this female since she was courted amorously by as many as seven drakes at one time. If she attempted to escape by flight the courting males at once took wing and formed a guard about her all flying in a compact flock with the female in the center.

This mating flight was marked by many sudden twists and turns at which times the female would hesitate or pause in mid-air as if waiting for some chosen male. At other times the female, while in full flight, would dive suddenly into the waters of the lake. When the duck dived thus she was followed under water by her entire host of admirers, each of which tried to keep nearest to her. At times the males fought so madly among themselves, striking at each other with bills and wings, that in the strife the poor female was lost sight of and was trampled under foot. In fact this whole courtship, which was watched for over an hour, was marked by the constant display and fighting of the males. The object of their attention was shown little or no consideration. It was real cave-man stuff from start to finish.

HAPPY FAMILY IN THE SHADE

After the courtship is over the female preens herself to hold the affection of her drake.

The final choice of a mate is made, not by the male but by the female, but upon what basis is not always apparent. In general those males which are in good feather and well groomed win out over the less favored suitors. But, then, the best plumaged males are also the most vigorous and since the courtship appears often to be largely an endurance contest the weaker unfit males are thus eliminated. Small, poorly-plumaged males lacking in vigor are usually the last to secure mates, or having secured a mate, are prone to lose them to more favored drakes.

By the last of January most of the Pintails have reached some sort of an understanding and the ducks are then seen swimming peacefully together in pairs, or resting side by

side in the shade of a bush. There are sometimes lonesome unattached-as-yet bachelors left waiting.

At this season the females begin to pay more attention to the preening of their feathers. Perhaps it is the first chance that they have to attend to this important matter after being "rushed," for having selected her mate the duck is at times hard pressed to keep him. It is not unusual at this stage of courtship to see the eternal feminine preening herself while her masculine admirer reclines at ease nearby, apparently asleep. However, if one looks closely, one will see that the drake isn't really asleep but has one eye open and is taking it all in—a typical masculine trait.

Even after the ducks have seemingly paired off their marital troubles have only just begun.

THEY "CUT IN" IN DUCKVILLE

Here is a handsome drake sailing in to steal away the mate of a less favored male.

AND HERE WE HAVE THE "STAG LINE" (Below)

One entrancing female is being actively courted by a quintet of drakes who are vying for her favor and may any moment fight for her.

The writer once watched two brace of Pintails that were dozing contentedly in the bright sunshine. Soon one of the drakes began to edge away from his own mate and waddled over toward the other pair of ducks. The male of the second pair was taking a nap at this time and did not see the interloper which began at once to make love to the unprotected female. The sleeping male awoke and looking over saw the other beautiful but seemingly unattached female, near at hand. He at once started to court her. Suddenly both drakes became aware of a rival and, turning, glowered at each other with bodies tensed, necks outstretched and bills sparring for an opening. Such, indeed, is the power and allurement of strange females, and the inconsistency—dare we say inconstancy?—of males.

A Forest Parasite

By S. S. Dickey

ONE OF the botanical curiosities of the eastern states is the squaw-root or *Conopholis americana.* Its scientific name refers to its peculiar likeness to a cone. Clad in a mixture of chestnut-brown and yellow, it stands like a ghost in the somber oak covert. In fact this plant has an affinity for the native oak trees, sending into the soil a cluster of stout roots which it finally anchors to the tangled roots of some chosen forest monarch. Here it literally steals a living from its host, and so thrives in abundance, arising season after season to add a charm to the favorite wandering place of the plant-lover.

THE CONE-LIKE SQUAW-ROOT

It has an affinity for oak trees, anchoring its own roots to those of some chosen forest monarch.

The squaw-root is a fleshy sort of a vegetable, covered with numerous globular seed capsules and interspersed with fringes of stout scales. Early in the season, during its first advent into the cheery woods, it has an appearance of youth and vigor. As the summer wanes, it takes on a dry, dead look. The black oak and the red oak are the trees most frequently infested with the squaw-root, but apparently they are little disturbed by the slight sapping of the nourishment required by the parasite for its existence.

"JUST MINNIES"

BY

Joseph Coombs Galloway

THE BOY stood on the creek bridge and looked down at the water. "There's fish in there," he cried excitedly. "What kind are they, Sime?" "Just minnies," said the hired man as he latched the pasture gate and started back to the barn. "Comin'?" "Not just yet," said the boy; "I want to stay down here for awhile."

He stood fascinated. Back and forth across the wide, shallow pool drifted the school of brown-backed minnows, alarmed by the shadow on the bridge; and by and by they gathered at the narrowed upper end, heads upstream, where the swift water had cut a channel after rippling down the gravel in a narrow path through the spearmint. He went down for a closer look. At the lower end little fishes were leaping into the air. They flashed like silver. He watched a while, and, wading in, tried to catch one from the crowd in the swift water. He soon found they were too quick for him, and they all went easily into the wide water behind him. So he followed up the narrow stream through the spearmint, and now and then saw dark little creatures dart through the rippling waters looking like a bit of the ripples themselves. One vanished under a stone; and, putting his hands down carefully around the front of the opening, he closed in on it until he felt something wriggle in them. Bringing them up, he saw, instead of the almost black little object that had fled under the stone, a shining thing of silver and steel blue, over which played most delicate tints of pink and lucent green. The boy had seen, on the willows along the creek, silvery pussies with a pink and green sheen like this, and had marveled; but this was a living jewel, a shining pearl that struggled in his hands. He longed to keep it, but he did not dare, and tenderly he put it back. Instantly it darted away, the same dark, little thing he had seen at first.

Next spring, when the sun shone warm on hawthorn and blackberry bloom, strange things happened. Big fishes, that ordinarily lay hidden in the deep places, wriggled and flapped in the shallows where the water rippled over the gravel from one pool to the next. And they were no ordinary looking fishes, either. There were great stone rollers, with fins banded with orange and black, rooting like pigs in the gravel with their horny noses; green-backed shiners, with three golden lines, some with milk-white fins, and some with all the lower fins and under parts rose and crimson, the upper fins, body and head overlaid with a blue-white bloom; and in the quieter pools little groups of dace gathered, striped with black and gold, a crimson ribbon running half the length of the body. They showed little fear. If approached too closely, they all retired to deep water, but soon came back again. For three days they worked, and then they vanished from the ripples. Where they had been were little patches of clean gravel. There were no eggs in sight; but deeper down, covered an inch with the fresh gravel, were little patches of eggs on the larger stones; covered so no hungry mouths could find them, but always washed by the running water. Ten days later, tiny fish, black-eyed slivers a half-inch long, idled in every spot of quiet water; and by fall they had doubled in length and much more in bulk, and became quite respectable little minnows.

Strolling by the brook, and seeing the schools swim lazily back and forth, or watching them at sundown, flashing their silver sides as they leap for gnats, it seems a peaceful and happy life they lead; yet it is full of dangers. Not for nothing are the dark backs, the silvery under parts. The enemies above, heron and kingfisher, look down on dark fishes on dark mud or gravel; but the enemies below look up to silvery fishes against a shining silver sky. Under almost every stone to which the frightened minnow darts to hide waits an armor-clad knight with nippers to receive him; and when the creeks are low, and accommodations are scarce for both minnows and crayfish, the toll taken by the latter must be enormous. In the long summer drouths the shallower pools dry up and they perish by myriads. Summer freshets, choked with mud, lift and grind the rocks as they roar down the channels. Spring floods, carrying out the crashing, grinding ice, are worse, and one wonders how any of the tender, delicate creatures can survive. Yet always, when the streams are quiet again, the pools are filled with minnows, and there seems no diminution of their numbers.

With two hundred genera and a thousand species, found all round the world in the north temperate zone, this largest of all families of fishes is composed mainly of small types differing little from each other; and in no other family are the species so difficult to distinguish. Most are soft-finned, round-scaled fishes; all are without teeth in the mouth, but have them in the throat on the pharyngeal bones. Some have teeth with a flat grinding surface and these are mostly herbivorous; others, mostly of carnivorous habits, have the teeth long, sharp and slender. Excepting the carp and goldfish, few are of any direct commercial value; yet they form a large part of the food of many of the predaceous river fishes and fill an important place in the economy of our smaller streams.

THE HERON AWAITS DINNER

Many of them during the breeding season are

among the most brilliant and beautiful of fishes; yet the study of their coloring at this season has been left to the specialist, and has been almost ignored by the rank and file of Nature lovers. The horned dace or chubs become rosy red, with many white tubercles. *Pimephales* has the head jet black, with a triple band of tubercles on the snout. The long-nosed dace, *Rhinichthys,* is spangled brass, with all the lower fins, lips and cheeks fiery orange red. *Chrosomus,* the red-bellied minnow, is brilliant with black and silver and scarlet, with yellow fins; and so on, down a long list into the undiscovered and unknown. Many of them make beautiful aquarium fishes, but if transferred suddenly into a goldfish globe or a bare and glaring tank, the colors quickly fade. They return again in the dark shadows of the water plants and caves of a properly equipped aquarium.

To the artist who, with brush and pigment, will take up the work of recording in permanent form the transitory beauty of the nuptial season there is offered a new field, full of delightful surprises, both for himself and for the many to whom his work will be a revelation of unsuspected beauty.

An Odd Little Hay Maker

By Ester Ellis Reeks

MAN IS not the only animal wise enough to cut and cure grasses and store them away for winter use. In the high mountains of our western states lives an odd little creature belonging to the hare family, known as the cony, or pika. Its home is in the rock slides above timberline, where it remains active during the long winters when its retreat is covered with a blanket of snow many feet deep.

PHOTOGRAPH ED TANGEN

HE STORES UP FOR THE WINTER

The wise little cony knows how to make hay while the summer sun shines and to store it against a hard winter.

In August, the conies work busily, making hurried sallies to the grassy meadows adjoining their shelters to nip off the herbage and carry it in bundles in their mouths back to the rocks. Here they dry it and store it away in stacks, where it can be reached from their runs under the snow in winter. Some of these stacks have been discovered which were equal in size to a bushel basket and contained as many as thirty different varieties of flowers and grasses.

Tourists who climb the mountains in summer often hear the queer little bark of the cony; and those whose eyes are keen may discover them at their work or see them perched demurely on some rock, which they so resemble in color as to be almost invisible, merely little grayish-brown patches on the boulders.

The Parasitic Dodder

By S. S. Dickey

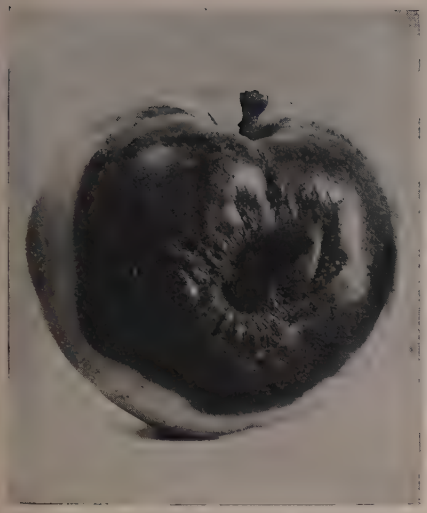
WE HUMANS do not view the parasite with enthusiasm, and yet wild Nature tolerates the fortune-hunter and in some cases actually fosters it that it may in time meet those ends for which it so keenly strives.

That striking flowering plant, the dodder, exists in two variant stages. First, during its germination and youth, it is an independent unit in the soil and, second, it is a typical parasite upon the stem of some wild herb. Why has it abandoned the mode of existence which typified its ancestors? The fact is that an advantage was to be obtained by the second choice of living, and so this tramp of the plant world, with little or no malice aforethought, readily adapted itself to sapping vitality from some unfortunate victim.

THE ENTWINING DODDER

A section of the stem of the host whereon the dodder dwells reveals the root-like bodies called haustoria, sent by the vagabond into the intricate tissues of its victim. The young shoots of the brier, the rank colonies of the water-willow, and the stout stems of that weedy pest, the yarrow, each comes in for its share of persecution at the hands of the invidious enemy.

Sometimes I wonder if after all this dodder caitiff might not be put to some useful purpose by the agriculturist, so that it would make constant onslaughts against the ever-increasing weeds of field and garden. But it is difficult to harness the gamin so that it will work in with man's oft-laid schemes to reduce Nature to servitude. Probably a plant so well able to take care of itself as the dodder would refuse to perform any service for other organisms.

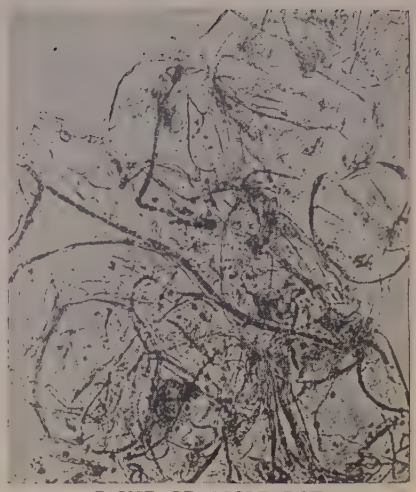


SOFT ROT OF APPLES

A tiny enemy fungus growing in the tissues causes this rot in the fruit.

This article, by Mr. Gregory of the Agricultural Experiment Station at Lafayette, Indiana, calls to mind these lines from Swift, that go:

Great fleas have little fleas,
Upon their backs to bite 'em,
And the little fleas have lesser fleas,
And so on ad infinitum.
And the greater fleas themselves in turn
Have greater fleas to go on;
While these again have greater still,
And greater still, and so on.



CAUSE OF APPLE ROT

The illustration shows the tissues of a soft, rotted apple and the fungus mycelium.

Some Tiny Enemies

By C. T. Gregory

DOWN amid the dregs of humanity is where we usually look for thieves and murderers. Among the lowest of savages we find the cannibals. Likewise in the dregs of the plant kingdom we find plant thieves, plant murderers and, worse yet, plant cannibals. We are told that cannibals are animals that eat their own kind. So is not a plant that eats its own kind also a cannibal?

Suppose we look at the plant kingdom as a vast mountain rising in the midst of a dark valley. At the top of the mountain we would find the majestic oak and other trees, and it would also be carpeted with grass and flowers. Down the mountain-side some distance would be the ferns, then lower still the mosses. Finally, away down in the murky, misty valley would be the lowest of all plants, the fungi and bacteria.

Though many of these fungi have evil habits, we must not censure them too severely; they cannot be anything else. Most of us are used to thinking of a plant as something that has leaves and perhaps flowers and which turns the earth a beautiful green in spring. This is true of the great majority of plants, but down in the valley beneath the mountain of green are these fungous plants which are not blessed with the green color or chlorophyl. I say "blessed" because chlorophyl in plants is a blessing; it is their passport to respectable plant society. In fact, we can say more than this. If this substance, chlorophyl, were suddenly to disappear from plants, everything on earth, and, finally, even the fungous plants, would die. In the last analysis, chlorophyl in plants is the keystone of the arch of civilization.

BARBERRY STAGE OF THE WHEAT RUST

Note the diseased splotches on the leaves, the reason for demand for eradication of the common barberry.

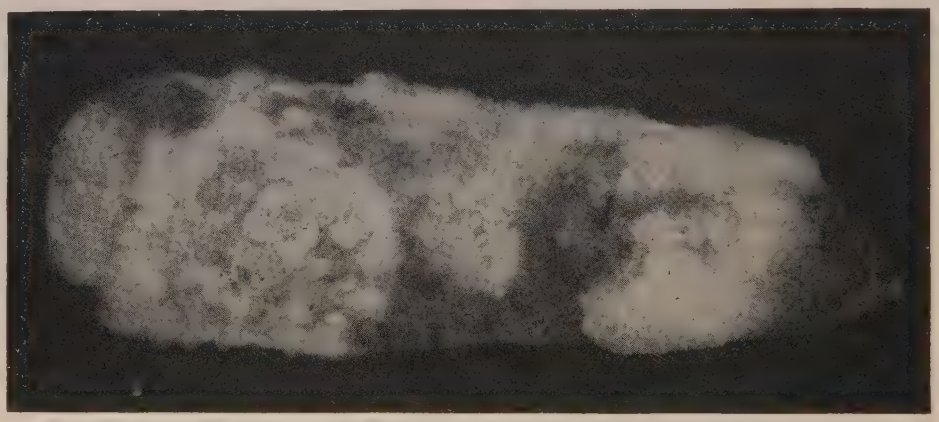
Why in this green stuff so important? What does it do that makes it indispensable to plants? We must look into the machinery of a plant for a moment to answer these questions. The roots, we all know, absorb water and the raw foods from the soil. All this material is then transported through the stem to the leaves where the chlorophyl r e s i d e s. Here in the leaves, through the power of the sunlight, this chlorophyl tears apart and reconstructs till the proper plant-foods are made. In other words, the wonderful structure of the oak tree is only a means of holding aloft to the sunlight the green leaves which are the factories of the plant. So much for the respectable members of plant society and the chlorophyl w h i c h

THIS IS FUNGUS MYCELIUM

The picture shows a photomicrograph of the mold growing on the carrot.

of the growth of the mold. If we examine the rotted tissue with a microscope, it may surprise us to find a mass of tiny white threads inextricably entangled in the tissue of the carrot. These white threads, or mycelium, are a part of the fungous plant acting somewhat like roots. However, it is hardly right to call this mycelium, roots, because it really comprises practically the whole fungous plant. In its search for food the fungus deliberately eats up the carrot, leaving only the soft, mushy mass that is mostly water. In other words, the fungus destroys what the carrot plant produced with its green leaves.

To delve a little further into the mysteries of this plant life we cannot do better than to examine the common bread mold. Who of us has not seen a piece of bread covered with a mold and plentifully dotted with tiny black balls borne aloft on slender stalks. Imbedded within the bread are entangled invisible masses of mycelium absorbing the food. As the fungus gathers strength its first effort is toward the perpetuation of its kind, which to a green plant may mean seed-formation and, to a fungus, spore formation. Most fungi are prodigious spore formers. The bread mold develops clusters of long stalks at rather frequent intervals on the mycelium. On the end of each of these stalks is formed a globose shell packed with the spores. A jar or a puff of air will break the delicate membrane, allowing the spores to sift out and float away. It must be remembered that all fungous spores are extremely tiny



A CARROT THAT IS QUITE PASSÉ

The mold is growing at the expense of the vegetable and is causing soft rot.

makes them independent.

Fungi do not possess this chlorophyl, and as a result they have become the scavengers of the earth. They are largely destroyers, not builders. They must make use of the materials built by higher plants and animals. Some of them can only live on dead matter and are known as saprophytes. Others attack the living plants or animals. These are termed parasites. Then there are some of these peculiar little plants that might be termed "hijackers," you know—the thieves that steal the stolen whisky from thieves. The plant "hijackers" rob and kill the parasites that are killing the green plant. It almost seems as if there is a parallel in the plant kingdom for everything in the animal kingdom.

Many of these tiny little fungous plants are our enemies because they are continually trying to destroy our food supply. There is hardly a crop that grows that does not have one or more different kinds of fungi that may attack it. The number of these fungi is enormous, and they cover a wonderful range of sizes and shapes, from the tiny little *Harpochytrium* which fastens itself to the lowly green pond scum to those giants among fungi, the mushrooms, which can kill and destroy majestic trees. It would be futile here to attempt any discussion of all this great family. However, practically all fungi have certain common characters, and if we can get on intimate terms with one or two kinds we will at least be on speaking terms with the others.

Before we start on this trip into the plant underworld, let me say that it is going to be necessary to do most of our looking with one eye, through a microscope. Most of us have seen rotting carrots or beets covered with a white mold, but how many have realized that the soft rot is the result

MILDEW ON BARLEY

This spot has been enlarged four times. Note the strands of mycelium creeping out over the leaf.

and can easily float for considerable distances in the air.

Let these spores fall into a drop of water and they will act just as any seed will do; within forty-eight hours they will sprout and start a new fungus plant which will be exactly like the parent. If the spore happens to fall on bread, a new growth of mold will result. If the spore is unfortunate enough to fall into a glass of water or on a wet dish, it will sprout, but, like the seed "which fell on stony ground," it will soon wither and die for lack of food. All this may happen and we will never know it, because the spores are too tiny to be seen with the naked eye. This accounts for some of the mysterious and sudden appearances of molds.

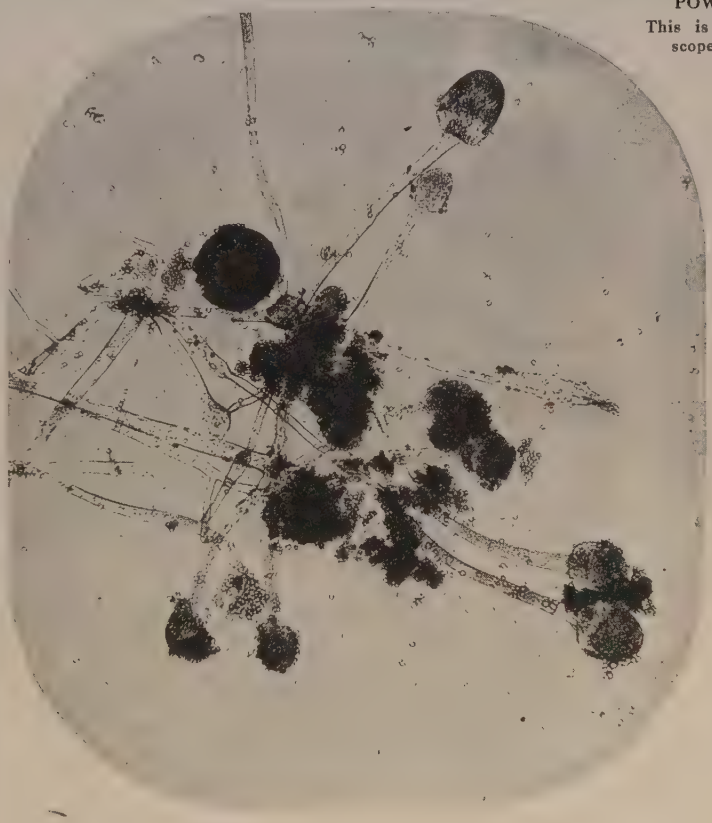
This, in brief, is the life of a fungus. Of course there are many modifications in different kinds of fungi. Those which attack plants start their lives as spores. These spores sprout on the surface of the plant, the mycelia grow into the plant absorbing food preparatory to producing new crops of spores. When the fungus robs the living plant of its food something is bound to happen, and that something is invariably death or serious injury to the plant victim of this attack.

Each year the wheat growers follow with strained and anxious attention the spread of the black stem rust. It would not seem as if this tiny little rust fungus could do much damage, but in 1916 the black stem rust caused a loss of 280,000,000 bushels of wheat in the United States and Canada. Every year millions of dollars worth of wheat is destroyed by this invisible pest, and each year hundreds of thousands of dollars are spent to fight it. The power of the black rust fungus lies in its ability to form spores in immense numbers. This power was forcibly brought to my attention one summer day. I happened to be looking out over a rust-infested wheat field just as a storm was brewing. The first sudden gusts of wind tore across the field, shaking the wheat plants vigorously, and before my astonished eyes there arose from the field a heavy red cloud that slowly drifted away before the wind. That cloud was composed solely of red rust spores! What other plant could literally color the air with its seeds?

A rusted wheat plant is usually completely riddled with small, black, oval spore-cushions. The skin is torn open in innumerable places, giving the stem a shredded appearance. Each one of these pustules is made by an individual fungous plant. Beneath the spore-cushion, and spreading slightly beyond its margins, the microscope can see the tightly matted mycelium growing in the tissues of the wheat. One such spot or even a hundred might be endured by the wheat plant, but when it is called upon to support thousands of these rust plants the limit of endurance is reached. It is true that the wheat does support the rust, but only at the expense of its own grain which becomes light and shrivelled and practically worthless.

And what shall I say of the legions of other diseases, the smuts, the scabs, the blights, the mildews and the scores of others? Who of us has not seen the large, black, dusty smut masses on the stalks of corn plants? I know of some children who are afraid of them and give such corn plants a wide berth as they pass through the field. Farmers are also afraid of them, but for a different reason. This smut causes serious losses. The black dust of the corn smut is nothing but the spores of a fungous plant which grew in the corn tissues. It has been estimated that in one good sized smut gall there

POWDERY MILDEW
This is the way the microscope sees this fungus.



BREAD MOLD FUNGUS SPORE CASES
The tiny round bodies scattered through the picture are spores. This is enlarged fifty times.

BLACK RUST OF THE WHEAT
Stems heavily punctured by the rust fungus and in the inset a photo of one of the spores.

are several billion spores. Even this is not a world's record in spore formation by a fungus. Heads of wheat, oats and barley are also destroyed by a similar black smut, but these different smuts, though similar in appearance, are all produced by different kinds of fungous plants. Late in summer lilac leaves usually turn white, and some folks think that it is the summer dust collected there. But again the microscope reveals a fungous growth so abundant as apparently to dust the leaves with a white powder. It is the lilac mildew.

I could go on and on describing the hundreds of fungous enemies, but we would only find what we found in the bread mold. These fungi are but tiny, colorless plants, living within green plants and by their growth causing disease and destruction. Each of these fungi produces its crop of tiny seeds which are blown by the wind or spattered by the rain. Under ordinary conditions not many of these spores will reach a satisfactory goal, but when they do it is not long before a new fungus is developed.

BELOW A CEDAR APPLE AND ABOVE A RUSTED APPLE

The brown columns of the cedar apple are covered with spores that infect the apple fruit or the leaves.

In the great task of meeting the problem of dwindling forest resources, the war against fungi is a major battle. A more adequate knowledge of the activities of tiny enemies that attack our trees assumes an importance that ranks with fire prevention, elimination of waste and the science of reforestation. Treatment of wood after it is cut, so that it will resist the attacks of various fungi, is a matter of the most vital importance.

When we know that many of the various diseases of plants are caused by fungi our fight to prevent their devastation becomes somewhat easier. Fighting an invisible enemy is difficult, but through the microscope we can direct our battle, making it most effective. We spray with Bordeaux mixture or lime sulfur, treat the seed with formaldehyde, or sterilize the soil, with but one end in view—to kill the fungus which the microscope shows is lurking dangerously there.

SOME GLIMPSES OF SEPTEMBER

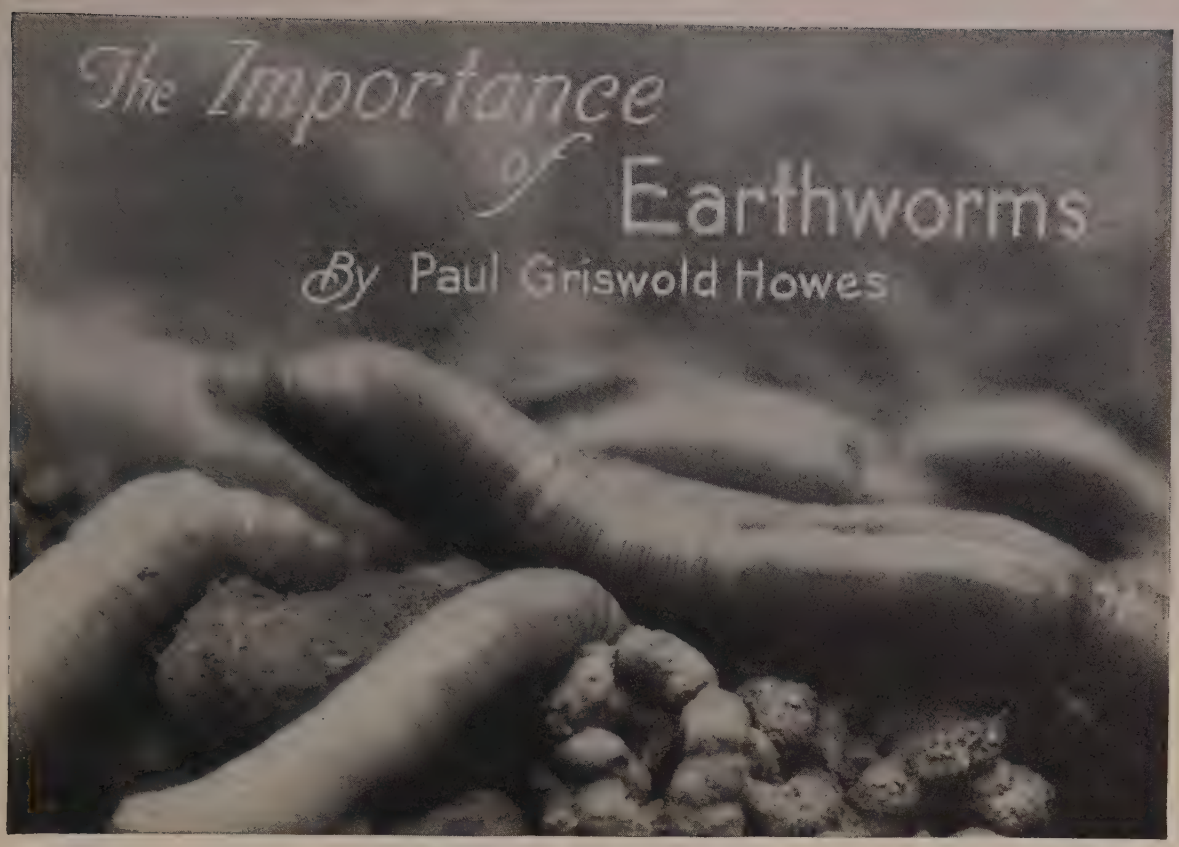
The September issue of NATURE MAGAZINE will contain twelve more of the beautiful color pictures by R. Bruce Horsfall. These will be subjects different from the insects, but what they will be we will leave as a surprise.

In the September issue Irene Finley will begin the "Story of Don Q." This is not the tale of a swashbuckling knight, but it is the story of a traveler of no mean importance and a character of absorbing interest. Incidentally the Finleys are gathering some more wonderful material in the region of the Pribilof Islands.

The September issue will also include articles by Horsfall, Talman, Howes, Shepheard-Walwyn and Palmer, as well as introduce several newcomers to the pages of NATURE MAGAZINE

The Importance of Earthworms

By Paul Griswold Howes



EARTHWORMS ARE REAL PLOWMEN

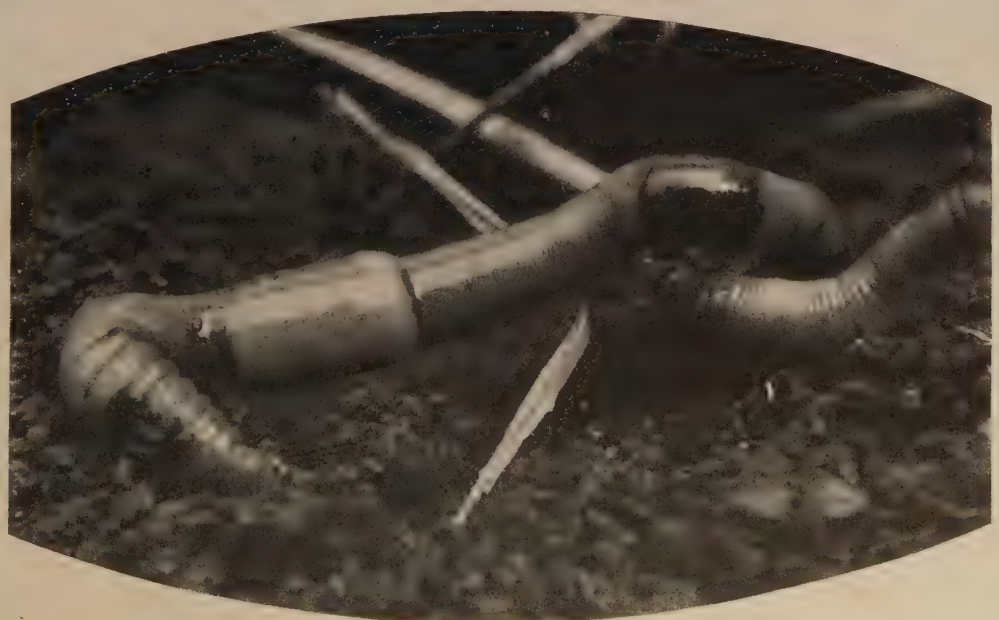
Here they are shown much magnified after they have been casting the earth taken into their systems.

WHEN I was a small boy, I distinctly remember my frequent excursions in search of "Night-walkers," as I called those extra large earthworms that made up the great bulk of my bait upon fishing trips. I went with a lantern, searching along the walls and lanes, where leaves had been allowed to collect and lie rotting since the previous autumn. On warm spring nights there would be numbers of them with their heads protruding from their burrows, among the leaves and grass and soil, and if a shower were in progress, or almost over, the ground would be alive with them.

As I walked slowly along with my lantern held close to the ground, the worms would draw rapidly back into their burrows and one would have to be very quick to catch them. If they were unusually numerous, as sometimes happened, a distinct rustling noise would be noticeable, as my collecting trip progressed.

In a short time my bait box would be full to overflowing, and as far as earthworms were concerned at that time, everything would be over until the spirit moved me once more to go fishing.

Since then I have learned to respect the lowly worm and have become deeply interested in its life and habits. How little does the average observer of Nature realize the all-important position that this creature occupies in the world!



NOTE THE CURIOUS SWELLINGS ON THE WORM

It is the clitellum and indicates that the worm is ready to lay eggs that are carried in this girdle.

Without worms, the land would be more arid. Vegetation would not reach its present state of luxuriance, and indeed much of the earth's soil would lie fallow and useless to many plants.

There is so much to tell about worms.

They are most numerous at the surface of the ground at night, during and after a shower. They come up to the surface at night to feed, as they are truly nocturnal animals, but the reason for their abundance when it rains is best explained by saying that it is simply a wise provision of Nature, by means of which she drills the ground full of holes, into which the water may run, and the all-important oxygen of the air may penetrate. Few of us think of worms as leaf and grass-eaters, but these creatures consume large quantities of the dead vegetable matter that lies on the ground. Holding fast in their burrows by their tail-ends, the worms reach out in all directions; stretching themselves to great lengths and grasping bits of grass or dead leaves, they pull them below the surface. Here some of this material is eaten, while vast quantities of it pass into vegetable mould that helps to make other things grow.

EARTHWORMS ARE DIMINUTIVE STEAM SHOVELS

When they are numerous as shown here and the castings are found close together, rough lawns will soon be level.

Worms have no eyes or ears, yet they are very sensitive to light, for they dart into their burrows with great rapidity as our lantern approaches. In addition to vegetable matter found upon the surface, great quantities of soil pass through the vast worm army. From this soil they assimilate and digest what is useful to them, leaving the remainder each night upon the surface in the weirdly formed and familiar castings that everyone has seen. Stop for a moment to consider the countless individual worms that inhabit every acre of ground. Think then of the weight and depth of a single year's castings that are left upon the surface, and you will realize that these lowly worms are actually responsible for the ploughing and turning over of the earth as the years go by.

When Darwin was a student at Edinburgh, he commenced to study the activities of the ground worm. He measured the ground in various places and estimated the number of worm-castings found in these restricted areas. He made estimates of all kinds and patiently and insistently studied these creatures. Then, the year before he died, appeared his famous book, "The Formation of Vegetable Mould through the Agency of Earthworms." In this volume he mentions the fact that in British soil there are found, on an average, 53,000 worms to the acre. These worms pass approximately ten tons of earth through their bodies each year. As they have been doing this for hundreds of thousands of years it is easy to realize the changes that worms gradually bring about. Darwin found that the castings of worms cover the surface to a depth of three inches every fifteen years; thus in the burial of ruins worms often may have played an important part.

In biology the earthworm is a very important animal. It is usually chosen as the representative of the animal kingdom for study and comparison because of the simplicity of its structure, the clarity of its position in relation to other animals above and below it in the scale of organization, and the ease with which it may be dissected.

There are many species of worms, but the commonest one of the garden is called *Lumbricus terrestris* and may be identified by its stout body and flattened posterior region. Another very common variety is *L. foetidus*. It is smaller and red, with a disagreeable odor, and is found in heaps of rotting vegetable matter.

The pointed end of a worm is the mouth end, and the flattened end is the "tail" end. In moving, the pointed end usually moves forward. In biology this is of vast importance, and the differentiation between the two ends of the worm is but the beginning of a series of modifications, extending upwards through more and more complex stages, culminating in man.

There are other features of comparative importance in the earthworm which become much clearer in individuals as we ascend the ladder to higher forms of life. There is the fact that one side is habitually turned up and becomes the back, while another and lighter colored side is habitually turned down and might be termed the belly. If we were to place a worm upon its "belly" and cut it longitudinally from end to end exactly in the center, both the resulting halves would be exactly similar. This is known as bilateral symmetry and becomes most striking as we ascend in the human body. From the two facts above, we see that the earthworm reveals two fundamental laws of organization, the law of difference or differentiation, and the law of likeness, or symmetry.

Another important feature of the earthworm, in view of the conditions existing in higher animals, is the fact that its body is marked off by grooves into a series of similar rings or parts, called somites. These grooves that we see on the exterior represent real divisions within the worm, which affect all the organs of its body, and which may be traced, though often with difficulty, in the divisions in the bodies of most higher animals.

To a certain extent earthworms can regenerate themselves, for, if one be cut in two, the anterior section will often regenerate the portion that is missing, while the posterior section may generate the anterior portion. Every individual worm is both male and female. Despite this,

it is necessary for the individuals to pair, and this takes place at night during the spring. It will be noticed, on a mature worm, that some of the somites or divisions, somewhere between the twenty-eighth and thirty-fifth, are swollen, forming a distinct girdle called the clitellum. When the worm is ready to lay its eggs, the glands within the clitellum pour out a tacky fluid which hardens and forms an even more distinct girdle around the body.

This girdle is now worked forward over the head of the worm and discarded. It contains the fertilized eggs, and as it leaves the parent worm its ends close tightly, forming a capsule that is more or less pointed at both ends. These capsules may be found under stones, or in earth or manure heaps in May and June, and are hard and brown in color. Within them the development of the young worms takes place. When the young ones at length burst from the capsule to take up their life in the earth, they are about an inch in length. As they have no clitellum at this time, or for some time, immature specimens may be told at a glance.

Finally, let me emphasize the importance of studying the biology of the earthworm, for when one has learned its habits, the functions and workings of its body and organs, the student has for all time, in his or her mind, many of the fundamental principles of the biology of higher animals.

Ceratosaurus, A Flesh-Eating Dinosaur

By C. W. Gilmore

Curator of Vertebrate Paleontology, U. S. National Museum

AMONG the dinosaurs, like many other groups of animals, there are flesh-eaters as well as plant eaters. One of the most remarkable of the flesh-eating kind, though not the largest, is *Ceratosaurus,* an active reptile that once roamed over the Rocky Mountain region, some ten or more million years ago.

The proportions of this animal remind one of a gigantic lizard with a short body, long tail, and strong hind limbs with large three-toed bird-like feet. The fore legs, however, were very small with four small toes armed with large curved claws like those of the eagle, which absolutely precludes their use in locomotion and indicates that walking was done entirely on the powerful hind limbs. The skull was large and had the jaws generously filled with sharp, cutting teeth with serrated edges. One of the conspicuous features of the head is the flattened bony horn that adorns the top of the nose and which has suggested its scientific name, *Ceratosaurus*, which means nose-horned-saurian. The tail is long and graceful and, as in other bipedal dinosaurs, served as a counterbalance to the body when walking about.

Its hollow bones indicate active movements and it appears safe to assume that it was a predaceous animal, active, powerful and well adapted to a terrestrial life. Its mode of attack was probably more like that of modern reptiles than that of the more intelligent methods used by mammalian flesh-eaters; we may well imagine the *Ceratosaurus* lying in wait, watching the near approach of his prey, when with a sudden rush, a snap of the jaws combined with a savage attack of sharp claws marks the doom of his victim. More leisurely he now proceeds to bite out choice morsels, being assisted by the holding power of the clawed fore limbs as mouthfuls are stripped off the carcass.

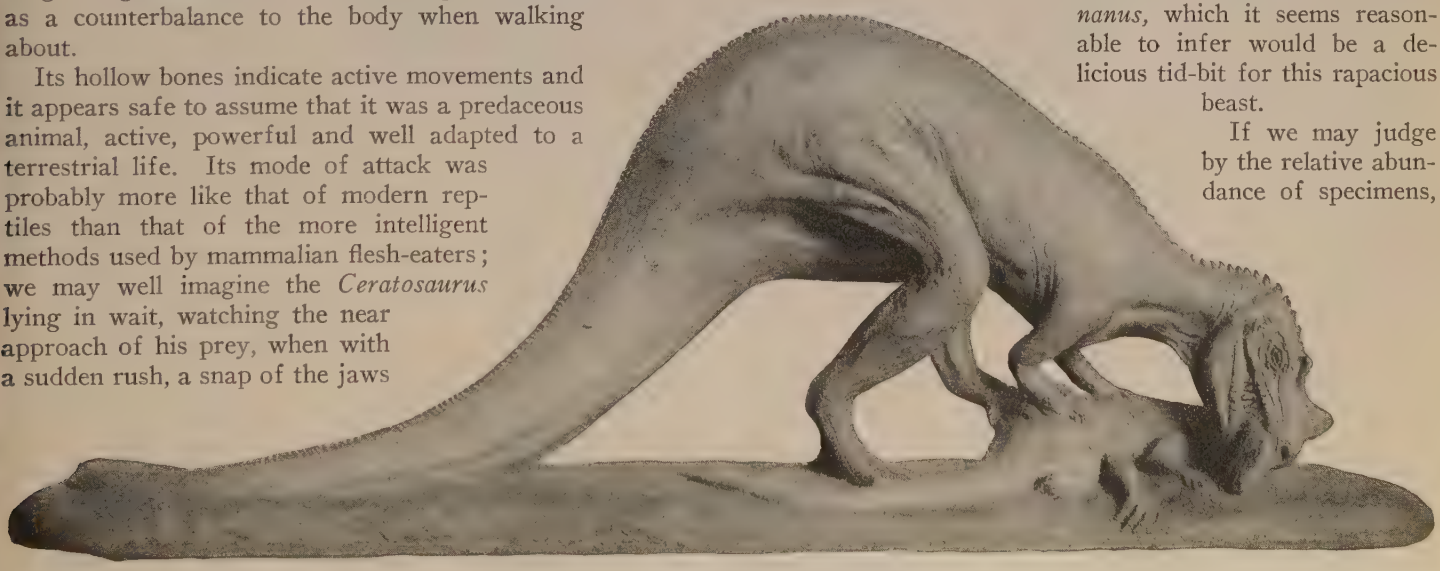
It seems most likely that the smaller herbivorous dinosaurs of the time formed his chief diet, rather than the big cumbersome animals of that period, for *Ceratosaurus,* as dinosaurs go, was of moderate size.

A skeleton in the United States National Museum, a fully adult individual, measures only seventeen feet in length, but at that he far surpasses in size most modern beasts of prey.

It has been suggested that this animal was a reptilian hyena feeding only upon dead carcasses, and in this connection it is of interest to note that tail bones of the large *Brontosaurus* have been found on which were distinct tooth marks clearly made by some giant carnivore while stripping the last meat off the bones. Broken teeth found near these bones give credence to the tooth marks having been made by a dinosaur of the *Ceratosaurus* type.

In the model restoration an attempt is made to depict *Ceratosaurus* completing the kill of a six-foot herbivorous reptile known as *Camptosaurus nanus,* which it seems reasonable to infer would be a delicious tid-bit for this rapacious beast.

If we may judge by the relative abundance of specimens, the flesh-eating dinosaurs were fewer in numbers than any of the plant-eating kinds, probably another illustration of the provision of Nature in maintaining a proper balance in numbers to assure food supply for these predaceous brutes.



ONE OF THE ANCIENT FLESH-EATERS

A mere matter of some ten million years ago this reptile roamed the region of the Rockies.

WELL NAMED SPRING GLORY
This daffodil belongs to the bi-color class with outer petals of white and a trumpet of golden yellow.

Daffodils

By Cornelius J. Van Bourgondien

(ILLUSTRATIONS COURTESY VAN BOURGONDIEN BROTHERS)

To the lover of daffodils this article should be at once a pleasure and a reassurance. It sets forth the situation with respect to supply and promises that the garden may have its usual beauties. However, it appears that the first necessity is to order one's bulbs early.

"HOW ON earth am I going to get any daffodils for my new garden? This new embargo does seem so outrageous," said a lady the other day. She did not know that, aside from paying a little more for the bulbs, she would be able to have most of her garden favorites as formerly. To be sure, the house-flowering paperwhites of ten-cent-store and pebble-growing fame and the grand yellow Soleil D'ors will be scarce for a few years, but a few years only. Those who would have bulbs of new and unusual varieties for display at flower shows may have trouble, but those who desire the old varieties need not entirely go without, provided an order for them is put in early in the season for safety's sake.

"Embargo" is not the correct word, as the law is only a restriction on the unlimited entry of bulbs into this country. After a long and thorough investigation, this restriction was found necessary in order to safeguard our own bulbs and prevent the spread of pests which came here with importations. The Department of Agriculture was not actuated by motives of trade protection, as many supposed, but by sound facts gathered through a study of the conditions.

The three pests which daffodils carry are the larger narcissus fly, the lesser narcissus fly, and the eelworm. These not only bring sure death to daffodils, but spread to other crops. The lesser bulb fly attacks onions and has already caused serious damage in the Pacific northwest, while the eelworm, although too small to be seen by the naked eye, is a menace to clover and alfalfa. As we have learned to our misfortune, many pests which have been brought here from other countries acquire different habits with the change of climate and become grave menaces to our agriculture, whereas, in their former habitats, they were merely annoying. The Japanese beetle is an infamous example.

Special permits are issued by the Federal Horticultural Board to commercial growers to increase the stock of bulbs in this country, but these permits are subject to strict rules to enforce the sterilization of bulbs upon their entry, and to make sure that they are for propagation and experimentation only, to be released for commercial purposes only after a certain length of time.

Many experienced Holland bulb growers came to this country to superintend our new industry. In order to reproduce as nearly as possible the growing conditions of Holland, one of the places chosen for this purpose was located on the south side of Long Island.

THE LEEDSII ARE DIFFERENT

This is a dainty group as this White Lady daffodil certainly shows.

THE STURDY KING ALFRED (Right)

This member of the large yellow trumpet class is a favorite.

close by, which prevents the atmosphere from becoming too hot in summer and also from extreme cold in winter. On Long Island the Atlantic Ocean is half a mile to the south and Long Island Sound a short distance to the north. The soil is sandy, and the days of sunshine for maturing the bulbs are many. A warm early spring is not desirable for bulb-growing as June is the time when the bulbs are forming new buds for next season's blooms, and if the weather is too warm, a rot sets in at the base.

Hardwood ashes are a valuable help in growing bulbs. They should be spread on top of the ground and raked in slightly, one pound to seven square feet being sufficient. Stable manure will produce the largest bulbs and the best flowers. Well rotted manure dug in before planting is the best, but if fresh manure is available, it can be spread on top of the ground in the late fall after planting and left there over the winter. In this way the harmful elements are evaporated and the needed ones seep into the soil gradually. A full wheelbarrow load will be sufficient for twelve square feet.

In Holland the bulbs are grown in sandy soil to insure quick drainage, as they cannot stand sour soil, and the district has numerous intersecting canals of fresh water. The North Sea is

"May I pick as many flowers as I need?" is a question often asked. The answer is yes, provided that, when picking, all the leaves are not cut along with the flower. Some of the foliage must be left as it is through the leaves as well as through the roots that the plant gathers its nourishment. It is well, also, to leave about four inches of flower stem on the plant.

The small-flowering types of bulbs, like the favorite Poeticus, may be left alone for years as they seem to flower profusely even when the bulbs are crowded, but the large trumpet-shaped varieties must be thinned occasionally and transplanted to get the best results. In transplanting the bulbs, they should not be exposed to the sun, but kept damp and replanted as soon as possible. Care must be taken not to cut or destroy the foliage after the bulbs are through blooming as this will reduce their flowering the next year. The foliage should die a natural death.

Let us have a necessarily brief glance at a few of the most popular types or classes of daffodils. First we have the large yellow trumpets, the varieties belonging to this class having long funnel-shaped trumpets which as a rule are longer or at least as long as the perianth segments commonly called outer petals. The perianth or outer petals of these are usually light or deep yellow, and the funnel-shaped trumpet even deeper yellow. These are as a rule sturdy, bold looking flowers. The large white trumpets are in shape almost identical to the large yellow trumpets, but like all white flowers are more delicate and not quite as robust or large, although very beautiful. When they open first the trumpet is yellow, growing lighter and prettier every day till at last it is totally white, sometimes with a creamy tint.

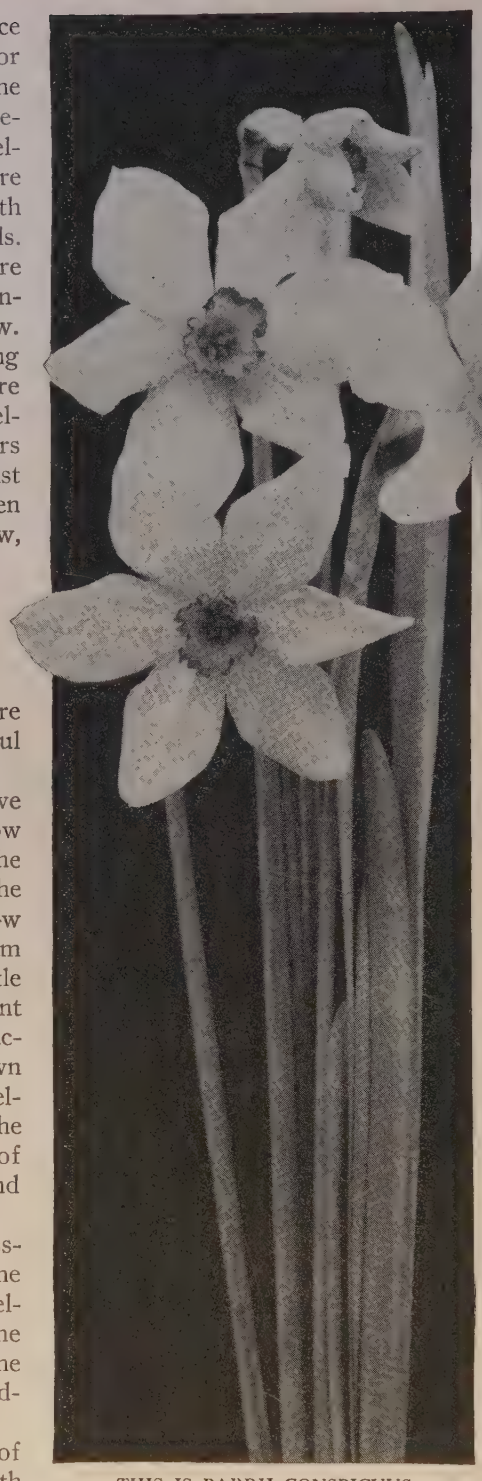
In the Bicolor we have a robust flower with the color of the trumpet deep golden yellow while the outer petals are creamy or pure white, making a beautiful combination.

The varieties of the Barrii type have been created by crossing the yellow trumpet varieties with the varieties of the Poeticus class—the Poeticus being the parent plant—with the result that a yellow flower with somewhat of a Poeticus form was obtained. The flowers are a little more robust looking than the parent plant. Some are very large and in practically every instance the red of the crown of the Poeticus can be found—an all yellow flower with a tinge of red on the edges of the crown in the very center of this flower. It is most wonderful and pleasing.

To create the Incomparabilis, the crossing was done exactly the same as in the Barrii class, but just reversed. The yellow trumpet was the parent plant with the result that the cup is longer and the flower all yellow or cream, but exceedingly pretty and very sturdy.

The Leedsii varieties are the result of crossing white trumpet varieties with Poeticus varieties, using both plants for parent plants. When one observes closely a variety of this class, instantly the dainty white perianth, sometimes prettily frilled and fluted, recalls the daintiness of the white-flowering varieties. The shape is similar to the Barrii varieties, but so much daintier and prettier when one likes creamy or pure white flowers. They are so different and yet so attractive.

Poeticus is the fellow that is so commonly used for hybridizing, and it makes one think there must be something exceptional about it, and so there is. It is pure snow white with a flat crown. This crown has a very heavy edge of scarlet, making it appear as almost an entire red crown. The fragrance is very pronounced but very sweet, making it a favorite. Millions are used for planting along shrubbery, in hardy borders, along walks and thin woods.



THIS IS BARRII CONSPICUUS

Beautiful offspring of the Yellow Trumpet and the Poeticus types.

The Poetaz is an exceptional class of bunch-flowered daffodils, created by crossing *Poeticus ornatus* and various Polyanthus varieties, *Poeticus ornatus* being the seed parent. We have long since discarded the Polyanthus narcissi on account of their strong, disagreeable and objectionable odor, but, strange to say, this bunch-flowering class, although obtained from the bunch flowering varieties, has not inherited this odor. The individual flowers have all, more or less, the Poeticus shape. We call these bunch-flowering because they have clusters of small individual flowers very much like a paper white narcissus. They are very suitable for forcing, besides being an excellent garden daffodil. Unlike Polyanthus narcissi they are hardy except in very cold sections of the country where a light protection will benefit them greatly.

Frequently one hears jonquil used to describe any class or variety of daffodils, and especially the double ones get the nickname. The jonquils are the daintiest of all daffodils and in a class all their own. They are an intense but pleasing yellow, with a delicious fragrance and thin wiry flower stems. The foliage is grass-like and two or more tiny flowers to a stem are not uncommon.

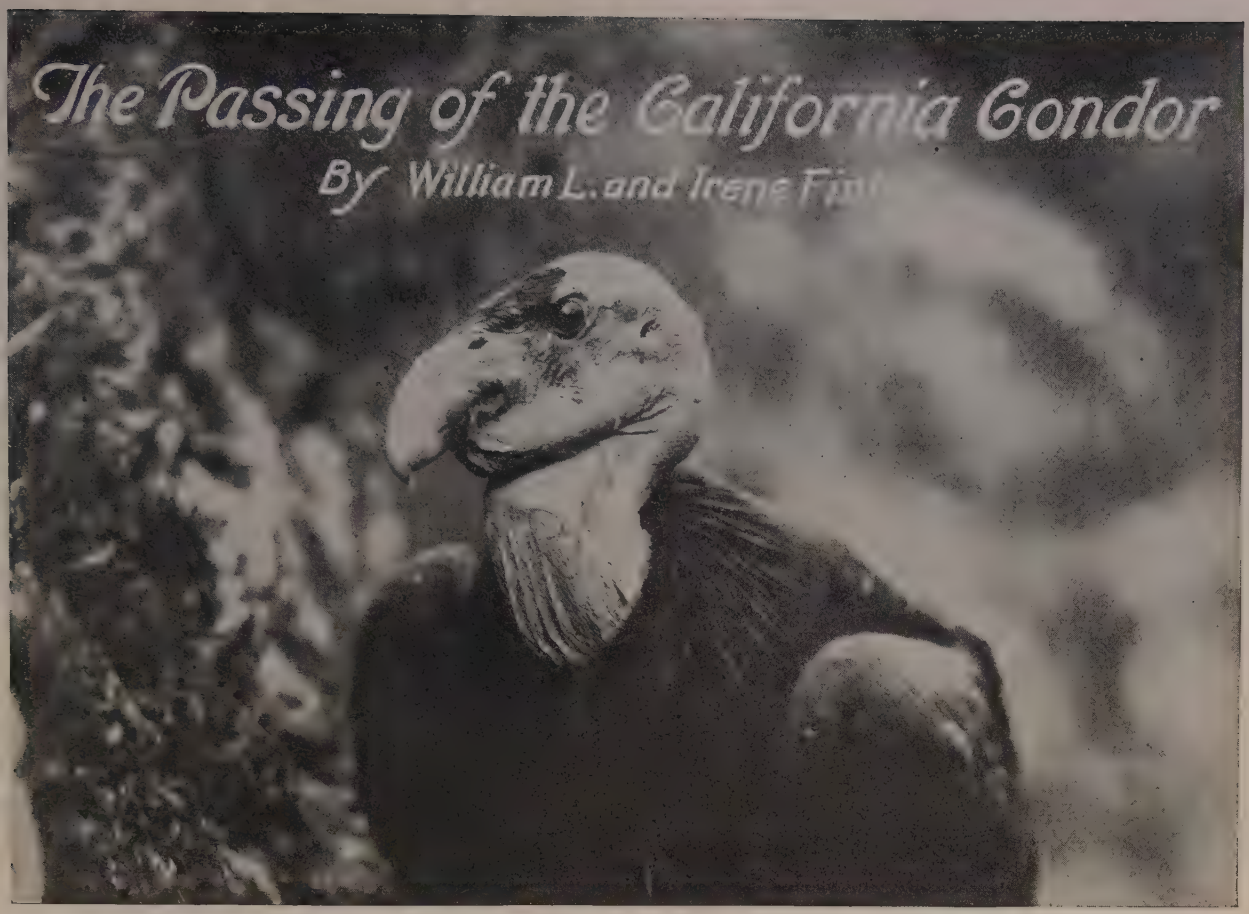
The Tridymus class came into being by crossing the yellow trumpet varieties of all shades with a class of tender daffodils called Polyanthus. The result was really unique and they are very hard to describe. The flowers which run in color from paper white to golden yellow are produced in clusters of from two to six small Incomparabilis-shaped flowers on one stem. They are, as our late horticultural friend Maurice Fuld used to express himself, "just delightfully different." They are that and more. They are and will be the foundation of a beautiful race of cluster daffodils, perfectly hardy and liked by everybody. It may be for that reason that they are yet very scarce.

There are still other types and classes, but most of them must yet prove themselves to be a success in the climates and soils of this country.

Daffodils have always been popular, even in colonial days, and they will remain favorites, holding their own with the later pageant of June flowers. Our fears that we must do without them because of the restriction are groundless and, after a few years of scarcity, bulbs should once more be plentiful and perhaps will be even better than formerly.

The Passing of the California Condor

By William L. and Irene Finley



PHOTOGRAPHS H. T. BOHLMAN AND W. L. FINLEY

A CLOSE-UP OF THE CALIFORNIA CONDOR

He is a queer-looking fellow with his bald head, feathered forehead and hanging jowls. The skin of the head is bright red, the neck orange and yellow.

THE half-timbered foothills of the Sierra Madres were rich with the color of blue lupines and golden poppies. Canons were dotted with live oaks and matted with chaparal. The panorama of low hills reached on an ascending scale back to a place in the rugged mountains where a giant rock escarpment cut into the very heart of the coastal range.

High above in the eastern sky appeared a tiny speck of black, the size of a distant star. It shot like a meteor at tremendous speed, this wide pinioned bird returning home after a long hunt. An old California Condor curved in a wide circle and brought up on the bent top of an old dead pine, the last relict of a departed forest that overhung the cliff.

The coming of such a big bird lent an air of mystery. Wings with a spread of ten feet fanning the air were an unusual sight. The landing was maneuvered only with strong back-pedalling of huge pinions that sung like the lash of a whip through the air. The dead pine swayed and cracked, as if struck by a sudden storm.

Balancing carefully, the big bird settled to rest. The skin of his neck hung loose. His bald head showed bright red against a small patch of black feathers between his eyes. His wrinkled pate and flabby jowls, with a caved-in expression of a toothless old woman, led the imagination back to some mysterious creature of the prehistoric past.

The keen eyes of this old condor were among the most perfect organs of sight in existence. From the old pine he looked out over the landscape miles away to fields forested with oil derricks where, in Pleistocene times, gigantic wolves hunted. Big animals these were, of heavier skulls and jaws, with more massive teeth than any that are living today. Great tigers crept through the ancient swamps, even now oozing oil. These animals were called "sabre-toothed" because of the long tusks, with sharp cutting edges protruding below the lower jaw when the mouth was closed.

In the remote history of southern California predatory animals had followed the trails, hunting horses, bison, deer, camels, elephants and large sloths. An old swamp of asphaltic ooze recently had given up the skulls and bones of these creatures, preserved as if they had been living in modern times. Scientists had taken out two carloads of specimens, carrying a story of absorbing interest to naturalists, a tale clearly written in the quagmire of oozing tar that had long since hardened. Among other paleontological prizes were the skull and leg bones of a big condor, twice the size of the old bird on the pine. Condors, or vultures, with a spread of wings of perhaps twelve or fourteen feet, had been the companions of prehistoric mammals that lived in the quaternary period.

The old condor that tobogganed out of the sky was one of the lone descendants of a far-away era. He returned to the old pine with a set purpose. He had been on a long day's hunt, covering hundreds of miles, and he realized his food supply was at a low ebb. Nearby, in a cleft or small cave in the cliff, was his mate and a single condor nestling—a youngster with a pink, bald head and coat of white down.

It was the middle of March. The egg had been laid a month before and the pair of old birds had kept faithful vigil, one keeping the egg warm while the other took up a

HE IS ABOUT THE SIZE OF THE ANDEAN CONDOR

The markings of the California bird are different, however, the bird of the Andes having a white band across each wing and a ruff of white down about the neck.

ALL SET TO SAIL OFF DOWN THE CANYON

In this pose the bird reveals the white lining of its wings. These wings are those of the largest birds of flight in North America, often spreading ten feet across.

long daily hunt for food. The months that followed showed a life far different from most birds. It takes about two weeks for a pair of robins to rear a bantling from egghood to full feather, but it took the old pair of condors nearly six months, or half a year, before the wing feathers of the nestling were strong enough to lift the weight of his heavy body, even in short flights about the canyon-bound confines of its home.

A study of the home life of this condor family revealed a remarkable record in the world of ornithology. The kindly affection of one bird to the other, the quiet devotion of both parents to the nestling, the implicit trust of these wild birds that allowed the camera men to shoot at them within a distance of six feet, the entreating anxiety of the mother nibbling the hand of the photographer, her intense note coming from a throat that was said to be voiceless, when the nestling resisted the invasion of his cave, the real show of friendship for the human, showed most striking characters in all bird history. But all this is a story that has been told.

The existence of the species is now at stake. At times it has seemed as if stricter laws and better protection, brought about by the educational work of the Audubon Societies and other lovers of the out-of-doors, might save the California Condor. But this may not be true. Every man has the right to carry a gun, and since it is the common habit to explore the wilder places and shoot at things that move and fly, legal protection has amounted to little. Any law must be backed by public opinion, and those who would save a vulture are few in number compared with those that do not care. During the past half century condor numbers have decreased so rapidly, and his range has narrowed so perceptibly, that we seem now facing his final disappearance. Can anything stop his flight toward ultimate destruction?

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AT HOME IN THE SIERRA MADRES

When at rest the ruff of long black feathers covers the neck of the condor like a big fur collar.

When we speak of the California Condor it must be distinguished from the condor of the Andes, which is a different species, although it is of about the same size and weight. The South American bird differs in its habits and is quite abundant. It is glossy black, with a broad white bar across each wing, and has a collar or ruff of white down about the neck. The head is unfeathered and covered with wrinkled red skin. The forehead has a cartilaginous comb, and the throat is wattled like that of a common turkey. The California Condor is blackish in color, with the feathers of the back edged with brown. About the neck are long, loose feathers that form a ruff. The lining of the wings is white and when the bird is soaring this is a distinctive mark from the turkey vulture, which is only about half the size of the condor.

The California Condor now has a range more restricted than any other bird of prey. In the early part of the last century it was reported fairly common as far north as the Columbia River region. Once it was reported in Utah, and Dr. Elliott Coues saw it in Arizona in 1865. With the exception of a record in southern Oregon about twenty years ago, the habitat of the California Condor now seems to have contracted to a region from Monterey County, California, south through the mountains of the Coast Range and the extension of the San Bernardino Range into Lower California. There seems to be no good record of the bird elsewhere in Mexico.

The fact that the California Condor is a very rare bird is clear when we realize that in the various museums and private collections of the world there are perhaps not more than fifty of its eggs in existence, while there are about seventy eggs of the Great Auk, a bird now extinct. It is not surprising, therefore, that collectors have been offering big prices, and there are always those who are willing to hunt out the last haunts of the California Condor in order to get the prize, even though it is a violation of the law.

The condor has always been a bird of utility. His part in the economy of Nature, from the dimmest pages of the past, has been to feed on dead animals. The prehistoric mammals that were trapped in the innocent-looking, water-

CAUGHT IN MID-FLIGHT

The condor's feet are down, showing that the bird is preparing to land on some convenient cliff.

like surface, where oil oozed out from the banks, were bait for the ancestral condors, and they died in the same death trap. The inexorable laws that did away with the sabre-toothed tiger also destroyed the giant condors that lived in his time.

During the past fifty years man has conquered air, land and water to such an extent, and the age in which we live is so utterly practical, that the utility of the California Condor has passed. Wild animals, upon which these birds feed, have grown less and less in number. The loss of domestic animals is likely to be smaller and smaller. Even if this were not the case, the practice of civilization is to bury or destroy the carcasses upon which vultures feed, for the sake of keeping disease from spreading. The food of the condor gone, how can he survive?

Compare the case of the bison, or buffalo, with that of the California Condor. The big animal of the plains could not survive with the settling of the country. He had to go when the prairies were fenced and ploughed. However, the buffalo is not likely to be destroyed, because he can live in limited areas. We have national parks and other reservations, and he will get along in smaller scattered herds. He can even live in captivity.

All this is not so with the California Condor. In all the zoological parks of the world he is not represented by a dozen of his kind. The California Condor must have a wide range; he must have food that can only be supplied under natural conditions. We have passed the point where a sufficient range that is properly protected can be supplied. He cannot live in an area that is settled and used by man.

With the shrinkage of wilderness areas has the California Condor not decreased to a point where it will be impossible for the bird to survive? In the life of any species, when it dwindles to a certain point it is on the downhill grade, then the speed of destruction increases rapidly to final disappearance. This was the case of the passenger pigeon, that entirely disappeared before its loss was realized. The heath hen of Massachusetts has almost finished the course of life, even though concerted efforts have been made to save it.

Shall we not see to it that the lesson of our beautiful pigeon goes not unheeded. It is, we hope, not too much to say that, had the pigeon survived in some numbers until today, it would be perpetuated. Our most beautiful species of waterfowl, the wood duck, had almost reached the threshold of oblivion when we forbade its killing, and the result is encouraging. Even now, however, there are other species which need similar help, such as the woodcock, a unique and charming bird not requiring large areas for its needs, but only a marshy thicket here and there, and surcease from the destructive gun. Of what avail is all our fine speech on protection and conservation if its principles be not applied where most needed? Why instill in the hearts of our sons and daughters this love for the children of the wild, if we meantime exterminate them?

The old pine where the condors perched has now fallen to decay. The condor cave in a cliff of the mountain is empty. The pair of condors pictured in these pages have taken their place with their ancestors of Pleistocene times. Their epitaph is written. Will this be the epitaph of the species?

THINKING IT ALL OVER

The old condor is sedately surveying the situation from a vantage point near its nest.

Some Interesting Things to See in August

By E. Laurence Palmer

(illustrated by R. Bruce Horsfall)

AUGUST is a sort of vacation month for many forms of life besides human beings. To some forms it is, to be sure, a serious period in their existence, but to a very large number of the conspicuous forms it is, if anything, less strenuous than those which immediately preceded it. The birds have raised one or more broods of young in most instances. The tadpoles of a large number of species of frogs and toads have transformed and left water for life elsewhere at least by the end of the month. The trees have practically ceased adding any enormous amount of growth for the year and are retrenching for the coming winter by maturing the wood variously. While many insects have "lived the life" for the current year, by the beginning of August a very large number are beginning to come into their own. Certainly, the insects of August are generally more noisy about their activities than the insects of June and considerably more so than those of July.

THE WATER OUZEL

Comparatively few fishes are concerned with their home ties during August if they ever are concerned with such matters. And when it comes to weather, we again find August in a sort of unconcerned situation. We may have some scorching hot weather with thunder-storms thrown in for good measure, or we may find equally scorching weather without the thunder-storms. On the other hand, we may find, if we live in the right parts of our country, weather that is very pleasant during the day and just agreeably cool at night. No matter what we may say about the weather, if we live in cities we will have to admit that, generally speaking, August offers ideal weather for living comfortably out of doors. The black flies of June and the great hordes of mosquitoes of July seem to have "had a heart" and let us get some pleasure out of the woods and waterways, which they can make so uncomfortable earlier in the season. If we have the good fortune to be able to go camping or tramping in August, we will find plenty of things of interest all about to occupy us.

THE SPIDER'S BALLOON

As I suggested, the birds have for the most part raised their young for the year. The beginning of August finds many of them retreating to secluded places to change their clothes—that is, moult their feathers. At such times they lack the vivacity of June and show little activity or vociferousness. Some of the birds may regain their voices after they have gained their new feathers, but if you are abroad at daybreak you will not be greeted with the choruses of the earlier summer. In the far west you may be entertained with the singing of the water ouzel during August if you have the luck, but I know of nothing like it in the east during that month. One of the interesting things to look for in August concerning birds is in regard to the moulted feathers. I have by my side a feather from the tail of a flicker. I picked this up on the lawn last August and it shows very well one way in which birds may apparently change their colors. As you may know, the feather shows an area almost black and other areas that are yellow. One part of the feather shows how the feather was worn down through use. Is there any difference between the wearing quality of the dark part of the feather and the light part? If there is a difference what is it, and if there is no difference does this rule hold on all the feathers of this or of other birds that you can find?

During August you may notice whole families of birds flocking together. As the season progresses these families my unite with others and sooner or later you have small flocks. There may begin to appear signs of restlessness indicative of the coming migration to the south, though some birds seem to decide to take a little trip on their own a bit further north before starting the southern journey. Do all birds act alike in these respects? Can you find any birds still nesting by the end of August?

August is a really good month to go fishing and since we hope you will have

THE DUCKWEED

MUSHROOM AND SLUG

luck and catch a few, we hope that you will find something of interest when you begin to clean your catch. Many fish show a peculiar slender line along their sides. This is known as the lateral line and is known in most cases, at least, to be associated with sense organs. Are these lines arranged in the same pattern on different individuals of a given species or do they vary as does the color pattern so frequently? Are these lines alike on all species? Do you find any species in which there seems to be no such line? Is the lateral line confined to the sides as the name implies or does it extend to other parts of the body?

During August, fish of many kinds rise to the surface of the water for their food. In many cases this food consists of insects of one sort or another. Sometimes these insects drown shortly after they hit the water and in other cases they do not. It might be interesting for you to determine whether an insect breathes through its head as do we or through some other part of its anatomy. Can you for example drown a grasshopper by holding his head under water?

Spiders are not insects but they, too, are frequently found on the surface of the water even though they may not be water spiders. They have even been found miles out at sea. Some of you may have the opportunity of seeing one of these spiders start on its ballooning voyage through the air. To do it they spin a thread of silk which is allowed to float off in the air until it has sufficient lifting power to support a spider. In this way a spider that would normally be able to travel but a short distance may in a short time move many miles with practically no effort. Do spiders give off this silk from the head end or from the rear end? As you walk through the woods or over open fields in early morning you may find spider silk striking you across the face or spread in great streamers on the ground. What uses can you conceive a spider might find for this floating silk other than the use of it in ballooning? If you wish plenty of other interesting things for August just watch a few spiders. They will keep you busy without any difficulty.

Ponds and slow-flowing streams may have their surfaces covered during August with small-floating plants such as duckweed or green with even smaller forms of life, that are marvels of beauty when looked at with a compound microscope. Since the duckweed may be seen easily with the naked eye and handled by hand let's confine ourselves to it. As you paddle a canoe through a duckweed-covered pond, you find it massed so closely together that the floating carpet closes behind you as you proceed on your way. It might be interesting to take a single duckweed plant and allow it to float on a tumbler full of pond water. Leave it a few days and see if you can solve the problem of how it multiplies itself. Does it produce seeds and reproduce in that manner only or does it have some other means? What seems to determine the end of the season for this sort of living things if such a thing seems to be clearly marked?

GOLDENROD AND RAGWEED

THE RED SQUIRREL

August may be a month in which some of the fungi like various toadstools and mushrooms appear on the scene. Of course we have had these earlier in the season and we will have them later, but August has its crop of these interesting plants. Many of them will show that they are looked upon with favor as food by many of the wild folk of the woods. I have found considerable fun in examining these gill-bearing fungi in August, trying to decide what had used them as lunch counters. There are insects, slugs, squirrels and many other creatures that avail themselves of the privilege. These creatures of course do not use the mushrooms as lunch counters from which they may eat other food. Instead they eat the counters themselves.

Speaking of squirrels, one is reminded that possibly they may offer interesting things to be observed in this month of August. Do the families of the year seem to remain together during the month, or are the families broken up and the individuals shifting for themselves? Do squirrels begin to show signs of laying up a store for the coming winter before the end of August, or do they reserve this work for the later months and just have a sort of vacation during the month when they have the best opportunity to enjoy one free from many of the difficulties which they have to face at other times in the year?

So far as the woody plants are concerned, many of them will be maturing fruits during August. It might be interesting to try to make a list of the different woody plants you

can find bearing ripe fruits during this month. This may bring you to notice that fruits seem to be covered with skins of very different types. A peach, a grape and a walnut certainly are not covered similarly. If you don't believe that these skins do serve as a protection, remove a portion of the skin from any one of these and see what happens. If you haven't already noticed it you might like to investigate a peach pit and find that it is not a seed but a part of the fruit which contains the seed. You may wonder how a delicate seedling can ever break through a peach pit, but remember that there is a difference between trying to get into a thing like a peach pit and trying to get out of the same thing.

August is also the month when our friends with hay-fever get into their cars and go to other climes. Some of us may envy them the vacation though they envy us the freedom from the fever. Many people claim that they get their hay-fever from goldenrod because of the fact that the fever comes on at about the same time that goldenrod becomes conspicuous. As you know, hay-fever is apparently caused by windblown pollen, and if you will try to get any great amount of pollen from a patch of goldenrod you may be disappointed. Certainly you will have better luck if you try to shake a little pollen from a single ragweed plant at this time of year. Hay-fever holds such a number of interesting problems that if you are really seriously interested in finding out something worth while from Nature and have the training you will want to get into it. It is only one of the many things in Nature that it is not only interesting to know about but may lead to a great deal of good. If you want to start out on the game, make a list of the weeds that you can find during August that apparently use the wind to assist them in the work of disseminating their pollen.

Bubo, the Great Horned Owl

By Edward A. Preble

THE GREAT horned owl (*Bubo virginianus*), including its several races, is one of the most widely distributed species in North America, being found everywhere from Mexico north to the limit of trees in northern Canada. It is an active, powerful bird and is able to overcome and devour a great variety of birds and mammals. Its capacity for good or evil, as far as man's material interests are concerned, is therefore very great. In many places, notably in the sparsely wooded parts of our western states, the bird consumes so many pocket gophers, ground squirrels, rabbits, wood rats, and other harmful rodents that it is very beneficial. In some localities, however, especially where domestic fowls are forced to find their own sleeping places in trees, a heavy toll is sometimes taken, much to the disgust of farmers.

BUBO, HIMSELF PHOTO CORNELIA CLARKE

This active and powerful owl is found from Mexico to Canada

In the far north, where the great horned owl feeds principally on rabbits, an undue scarcity of its favorite food may cause large numbers of the birds to migrate in winter to southern Canada and our northern states, where its depredations on poultry and game birds cause a price to be put on its head.

This owl nests very early in the season, usually on the branches or in the hollow of large trees, but often on cliffs or clay banks.

We should not like to see this fine bird disappear from our forests. Its strong *"To whoo-whoo-whoo"* heard from our deep woods or rocky glens, and carrying far in the still air, constitutes one of the most fascinating of the night voices, and lends a wildness and charm to our forests, already too sadly devastated, which could ill be spared. For all his faults, then, Bubo has charm.

How Caves Are Formed

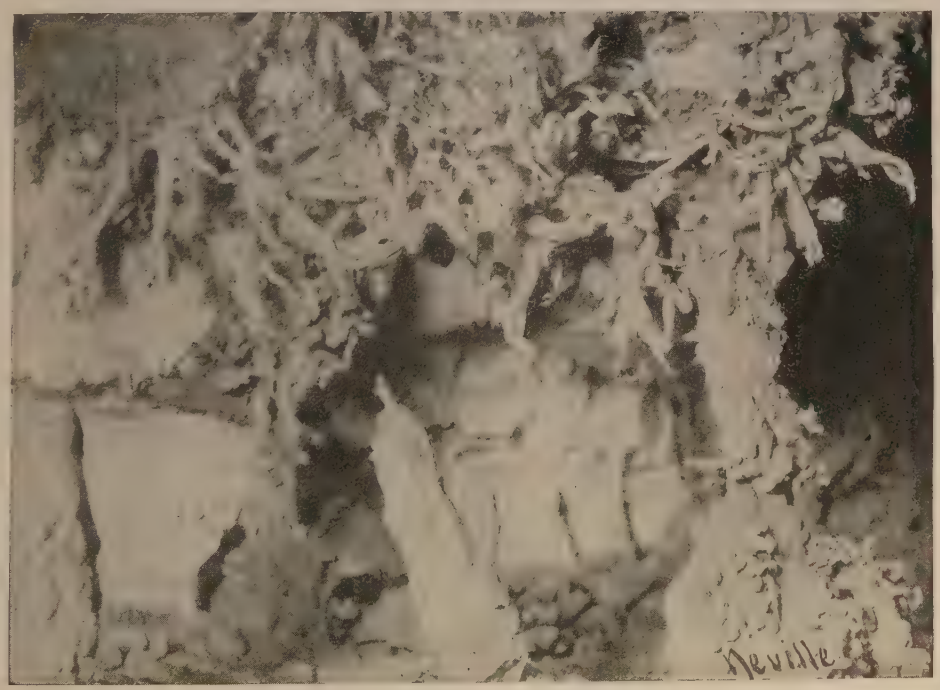
By Russell T. Neville

There is a fascination about caves. They smack of mystery. The Kentucky caves are well known and of great interest. The author of this article, a Kewanee, Illinois, lawyer, has made a special study of this cave country and has taken some remarkable photographs.

THE NEXT time you visit a soda fountain, note how pitted the marble counters are. In the carbonated water with which the drinks are prepared there is carbonic acid gas, which soon affects the solid stone by dissolving out the lime in its structure. Of course the acid is not of very great quantity in the soda water, and yet the chemical action is apparent on the counter.

In southern Indiana, and extending over into Kentucky, we find vast deposits of limestone. Bedford limestone is famous and well known wherever stone is used for building purposes. Geologists call this Carboniferous limestone to distinguish it from limestone found in many other strata.

It may surprise you to know that rain in falling absorbs carbonic gas from the air, and this water, picking up more carbonic acid as it seeps through decaying vegetation in the soil, finally carries enough of the chemical to dissolve out huge channels and chambers in the solid limestone. In this way the Kentucky caves have been formed. The acid-charged water has percolated through fissures and faults in the limestone, dissolving out an ever-increasing channel as it rushed to lower levels and perhaps finally emerged as a surface stream.



LIKE THE HEAD OF MEDUSA

Another formation of helictites found in crystal cave and showing the eccentric vagaries of cave formation.

All through the cave country of Kentucky even the most casual observer will note deep depressions or "sink-holes." Some of these are filled with water for at least a part of the year, and others are dry. They have been

formed, first by the water dissolving out a room or hole in the rock, and then, the supporting strata above being weakened, the whole has collapsed, leaving these familiar features of the landscape as a result.

Where the rock above the limestone has been thick enough to support the earth surface, caves have resulted, and these interesting phenomena sometimes are very extensive, as in Mammoth Cave, Old Salts, and Colossal Cavern in Kentucky, and many others in different parts of the world. The erosion by the water has been hastened by debris carried along in the rush of swirling streams to lower levels in the limestone.

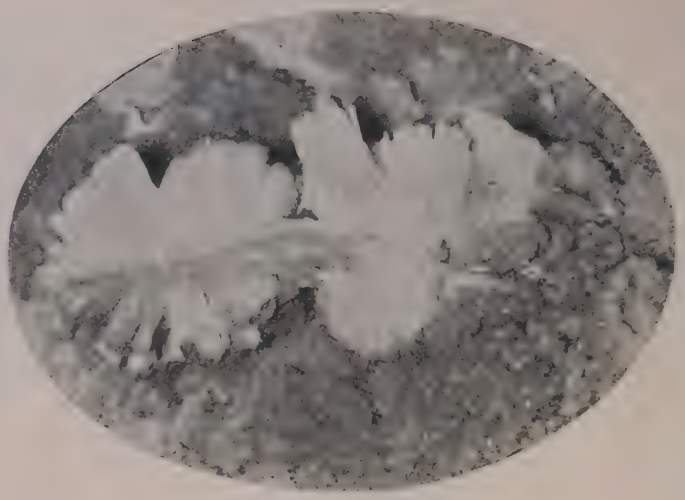
Caves are formed about the main axes of erosion similar in shape to the branches around a tree trunk. Thus we have great cave systems branching off from a main passageway, all formed by smaller streams and rivulets of water dissolving out a course and finally uniting with the larger or principal stream forming the main cave channel. Springs trickle down the rocky walls of many caves today, showing that this slow process of Nature still continues.

In the lower levels of some Kentucky caves are considerable bodies of water. In Mammoth Cave, for instance, is the far-famed Echo River with its tributaries, and Colossal Cavern, Great Onyx and many others have spring-fed pools of considerable depth and size.

Whenever the carbonic acid in the water comes into contact with the limestone, carbonate of lime is formed, which is not soluble in water. But the water carrying this chemical in suspension seeps down through holes and fissures in the rocks, and as the water evaporates the mineral or chemical content is deposited; in this way, through the slow ages, stalactites and stalagmites have slowly been formed. Generally the stalactites dependent from the roof are the smaller of the two formations. The water runs down these and falls, a drop at a time, to the floor, where evaporation takes place and a stalagmite "grows," fed always by the slow, constant drip from above. When the water seeps down through a fault or fissure in the roof there is formed a curtain or drapery of thin, onyx-like material, displaying all the graceful folds of rich materials draped by a master artist. For the most part, stalactites and stalagmites appear dull and dirty, but when broken and polished they often exhibit concentric rings of color, caused by iron oxide, manganese or some other colored chemical which has been carried in solution in the water by which the formations were made.

Some of the most beautiful formations are gypsum flowers and plumes. These grow in all manner of beautiful shapes, and on the ceilings and walls of many passageways you will find almost every delicate design ever seen on a frosted window pane.

Cave exploration holds something of interest and beauty for the layman as well as for the learned scientist. Here will be found pictures no artist can paint and formations no sculptor can duplicate, and all of them have been formed by tiny drops of water, laden with so prosaic a chemical as gives zest to your soda at the corner drug store. Even the most casual visit to these fairy wonderlands will reveal unequalled beauties.



SOME FLOWERS OF GYPSUM

Nature makes as beautiful designs in gypsum as she ever traces on a frosted window pane.

WELL CALLED, "THE BANANA STALK"

This is a curious helictite formation found in Crystal Cave and certainly resembling a stalk from which the bananas have been plucked.

Here is the story of the little rodent frequently and erroneously referred to as gopher. He is often the object of no uncertain expletives on the part of the farmer and plainsman, but for all his depredations is an interesting little fellow. On the right we find him making friends in a tentative way with the author, and on the left he is on the qui vive, looking for action.

Richardson's Ground Squirrel

By J. Dewey Soper

THERE is no more characteristic animal of the western Canadian prairies than Richardson's ground squirrel. Clad in grayish-buff and erroneously known as "gopher," it can hardly be confused with the two other species of ground squirrel in its range. One of these is the thirteen-lined spermophile, or "striped gopher," whose series of contrasting stripes over the back, with light-colored spots between, give it a dot-and-dash effect like the Morse Code. This species inhabits the open grasslands, as does Richardson's ground squirrel, but it is much less common and widely distributed. The other species is Franklin's ground squirrel, a large, silvery-gray, handsome animal, resembling the familiar gray squirrel of the eastern hardwoods. This animal, however, is strictly of the ground and never climbs, so far as known, though it is never found away from woods and "bluffs" in the prairie country. It may be considered a true brush species, while Richardson's occurs only on the open prairies.

Richardson's ground squirrel, like all the rest of the genus, is a true hibernator. Aside from a small quantity of rose pips, seeds and grain which may have been stored away during the autumn, the animal spans the winter practically destitute of food. It depends, like the bear, upon the thick layer of fat which accumulates over the body during the fall. This fat, when the fire of life is banked and breath and heart grow feeble, contrives to feed the flickering flame of existence during the long winter's sleep.

Richardson's ground squirrel is relatively hardy, though it spends six months or more of every year under ground. As a rule, it appears some time in late April. Should a belated snowfall cover the ground it does not hustle back but scampers about during the warmer hours of the day, looking somewhat ill at ease. In the fall, the majority of the animals do not finally disappear until mid-October, and many remain out until the first week of November. An early snowfall does not drive them in, though it may hasten hibernation if the cold continues. Otherwise the animals forage about in the snow with little concern. At last, however, the sun is unable to counterbalance the nightly frosts, the ground steadily becomes harder and harder, midday cooler, the light successive snowfalls linger longer. At last, with the coming of the northern winter, the ground squirrels retire to their long unbroken slumber.

Comes spring. The last snow-bank in lee of fence or deep in coulee has vanished. The first crocus timidly emerges from the flattened, faded herbage of the plains. The sun climbs higher in the heaven, lengthening the days and curtailing the nights. At midday the first, faint heat-shimmer dances from the vast, lonely circumference of the prairie. Daily miracles are happening. The "smacking" notes of the junco are heard in the "bluffs" mingling with the sweet, subdued warblings of tree sparrows. The pebbly song of the horned-lark rises faintly from the old ploughing; the plebian robin and crow cleave across the bleak countryside; the azure bluebird with sad, sweet calls flits daintily from post to post of the fences, and the joyous flutings of the inimitable meadowlark proclaims the arrival of spring. What sweet, mad hours! The tide has turned at last, and old winter, after many a scuffle, retreats ignominiously northwards. All the birds shout triumph, as it were, from every bush and boulder. The mallards, goldeneyes, widgeons and pintails fill the melting sloughs with daily arrivals and the air with a glad pandemonium of strange articulations. In a day or two the vesper sparrows arrive unobtrusively, and from the breast of the prairie swells chant their plaintive, unhurried melodies. Spring has come. The first flush of green spreads rapidly over the gentle undulations. And now, as though the daily swelling chorus of singers had virtually

penetrated to their dark chambers, the tardy ground squirrels come out blinking at last from their long imprisonment, surveying leisurely this old familiar world with its folds of sunlit prairie.

It is not for several days after the appearance of the first venturers that the ground squirrels become common. In Alberta this occurs about the twentieth of April. Their sole concern at this time is to satisfy ravenous appetites. These fellows are notorious feeders—gormandizers of the first degree. The winter starvation is hardly satisfied until it is time to lay to and accumulate fat for another long siege of sleep. And so, like the Indian, they feast and starve alternately, being good at either as fate or fortune disposes. Their large appetites waken the ire of the western farmer. Where they are not subdued with trap, gun or poison, they increase prolifically and swarm in hordes to the wheat and oat fields, leaving complete destruction in their wake.

ON SENTRY DUTY

This ground squirrel boasts a ravenous appetite and is a gormandizer of the first water.

These ground squirrels live singly or in colonies and give preference always to low sandy or gravelly swells on the prairie where excavation is comparatively easy. While they usually like well-drained home sites, they adapt themselves readily to a great variety of conditions. As the summer advances they may be found occupying even the dried-up, alkali-coated bottoms of sloughs. They know the vitalizing value of dry beds and sunshine and spend long hours sitting on the sandy mounds before their burrows. Their languid "seeps" of contentment is a familiar sound on the prairie. The tail goes up with a smart flip as though it were a part of the voice. In some parts of the country the animal goes by the name of "flicker-tail." The young are born in May and are big enough in five or six weeks to forage for tender shoots near the burrow. Their growth is extremely rapid, and by the first of August they are scarcely to be distinguished from their elders.

Richardson's ground squirrel has many natural enemies, among them the long-tailed prairie weasel and several hawks, especially Swainson's hawk, and yet so prolific is the race, even with man's intervention, that in some most favored localities there seems little appreciable reduction of their numbers. In parts of Saskatchewan, where the species has been under persecution for more than forty years, to the novice on his first arrival in the west they appear tolerably plentiful still, yet he is told that they represent but a fraction of their great former numbers.

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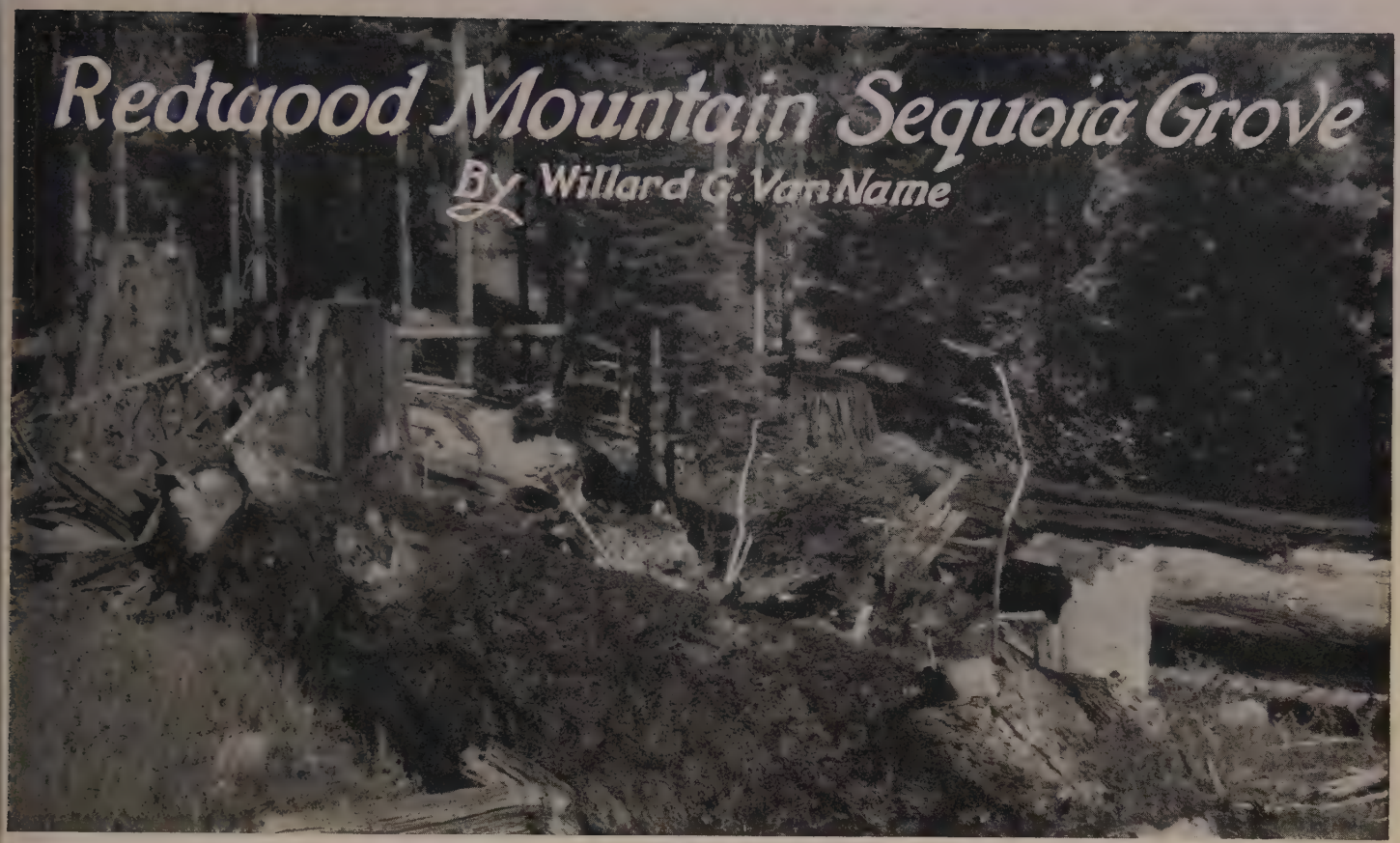
"A GOOD START"

Redwood Mountain Sequoia Grove

By Willard G. Van Name



RUINS OF FORTY YEARS

These redwoods were cut but because they broke up so were left lying where they fell.

IT IS not generally known that one of the finest and largest of the few remaining groves of big sequoias, the Redwood Mountain Grove, is still in private ownership, and may be cut for lumber at any time its owners decide upon such a course. This grove is situated with its center just midway between the Sequoia and General Grant National Parks in Tulare County, California, and will be near the highway to be built connecting those parks. By some it is claimed to be the largest grove still standing, but after seeing all three the writer is inclined to believe that it is exceeded by both the Garfield and Giant Forest Groves in the Sequoia Park and therefore regards it only as third in rank. Nevertheless it is a most magnificent one, containing many trees of unusual size, and it is also remarkable for the density of the growth and for the unusually large proportion of the giant sequoias in it.

(Left) THERE ARE MANY GIANTS

Although the most striking feature of this grove is the density of its stand, some are large.

It occupies a ridge having a north and south direction, as well as the slopes of a deep valley known as Redwood Canyon which lies on the east of the ridge, and is only a couple of miles from the northwest corner of the Sequoia National Park, so that a small extension of the boundaries of the latter would take it in. It is also very near the General Grant Park and would serve admirably in any plan to connect up those parks, which lie only six miles apart. Its altitude varies from about 5,500 to 7,000 feet above the sea, its trees being, of course, the true big sequoia of the mountains, not the coast redwood, as the name of the mountain and canyon might mislead the reader into supposing. That some of them are very nearly as fine specimens as are to be found anywhere the photographs will show.

The reason that this fine grove has escaped destruction

for so long, though not in the protection of any park, is the same that has caused it to remain almost entirely unknown and to be visited by only very few tourists, though so near the parks that have thousands of visitors every summer. It is reached only by a very poor road with long and steep grades, and intervening hills keep it from view from any of the commonly traversed roads.

Many years ago some of that part of it lying on the west slope of Redwood Mountain was cut and sawed up in a mill erected near by, but the main part of the grove remains untirely unharmed except for a few trees cut in the canyon perhaps forty years ago. The immense logs, or most of them, are still lying where they fell, and form an instructive object lesson of the wastefulness of big-tree logging, for, as is so often the case, they broke so in falling, due to their brittle wood and immense weight and height, that they were never utilized. Owing to the few trees cut and the density of the surrounding growth, the destruction in this one spot does not seriously mar the beauty of the grove.

Any more destruction of big sequoias for posts or grape stakes would be real vandalism and this grove should not suffer the fate that the Converse Basin Grove (the largest in the world), the Atwell Grove and others have met with. Its inaccessible location greatly reduces its value, and the sum necessary to buy it in for permanent preservation would be an insignificant item not beyond the means of many a wealthy man. What more magnificent memorial could anyone leave than to give such a grove to the nation to be preserved from vandalism for future generations?

(Right) VIGOROUS MIDDLE-AGED TREES

There are many of these which insure the magnificence of the grove for centuries to come.

A FALLEN GIANT

It may have lain where it is for a century or more as the sequoias are almost proof against decay.

LAMARCK: A NEGLECTED GENIUS

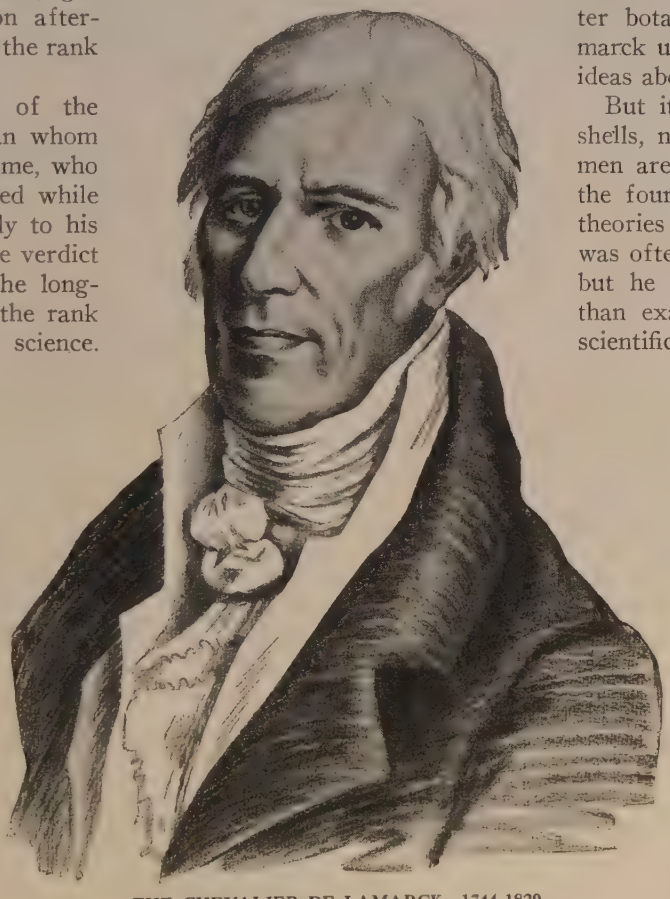
By Donald C. Peattie

(illustrated by garnet jex)

A LITTLE band of fourteen grenadiers stood alone, facing a whole army of Germans. Youngest of all the Frenchmen was a thin boy, Jean-Baptiste-Pierre-Antoine de Monet, to be known to future generations as a great scientist, the Chevalier de Lamarck. An old grenadier, who saw that the company had been forgotten by the rest of the French Army in its disastrous defeat at Lippstadt, advised that the little band should escape as fast as it could. "But," said the young chevalier, "we are assigned to this post and we should not withdraw from it until we are relieved." And so they stayed. Presently a French colonel, perceiving the little company holding its ground, got word to them to retreat. Soon afterwards Lamarck was promoted to the rank of an officer.

This story is characteristic of the whole career of Lamarck, a man whom no one ever appreciated in his time, who was ridiculed and even persecuted while he lived, and yet held steadfastly to his beliefs and principles. Today the verdict of men of science has raised the long-forgotten name of Lamarck to the rank of a general in the army of science.

Lamarck, who had been born in a little Picardy farmhouse on August 1, 1744, was still a young man when he published his first important book, an illustrated guide to the flora of France. The popular writer, Rousseau, had first turned Lamarck's attention to botany and had already made "herborizing" a fashionable pastime. When Lamarck published his three immense and expensive volumes on French flowers they were all immediately bought, and this was perhaps the peak of Lamarck's popularity with the general public. A polite interest in botany was just then the rage among young ladies and noblemen looking for a new amusement, and their interest in the science was probably not very sincere. But it did give Lamarck a chance to publish this mighty treatise.



THE CHEVALIER DE LAMARCK—1744-1829

But the day of idle noblemen and noblewomen was soon to end. The Revolution came, and The Terror, and several great scientists lost their heads in the bloody confusion that followed. Throughout it all the little band of scientists at the *Jardin des Plantes,* or Botanical Garden of Paris, tried to keep afloat. There was little money to be wrung from a pugnacious government run by ignorant peasants, and there were times when it seemed that all the small band of learning would be thrown out on the world. Lamarck, who had six children and a salary of about five hundred dollars a year, had personal enemies to contend with also, for some scientists of influence did not like him. He did in fact lose his place as a botanist, but he gained another as a zoologist, and perhaps this was a real benefit to science and even to Lamarck.

Once fairly started on the study of animals, in which Lamarck had always been interested, he revolutionized all notions of how various kinds of animals were related to each other by families and groups of families. In doing this he set up his own, less-known name against the authority of the great Linnaeus, who had classified animals differently. In truth, however, Linnaeus was a better botanist than a zoologist, and Lamarck undoubtedly greatly improved our ideas about zoology.

But it is not as a great authority on shells, nor as a systematic botanist, that men are now honoring Lamarck, but as the founder of the earliest of the great theories of evolution. Lamarck's mind was often faulty when it came to details, but he had one ability that was better than exactness in small things—he had scientific imagination. At a time when other people merely regarded it as mildly curious and interesting that all desert plants, for instance, had certain similarities, Lamarck was asking himself *why* this was. At a time when conchologists were not interested in fossil shells because they were not "pretty" like recent shells, Lamarck was reading in the records left by fossils the history of the animal kingdom.

Lamarck's theory of evolution, substantially, was this: Plants and animals have changed because they adapted themselves to different conditions; a water plant whose leaves grow in a certain way advantageous to the plant while it is in water will, if the plant is transferred to dry soil, produce different leaves. A botanist, comparing the two plants, would call them two different species. Actually they would be one species. However, through the long ages, conditions imposed on plants and animals have left their indelible imprint, and so it is that new kinds of plants and animals have arisen.

Whether or not Lamarck was right has been hotly debated from that day to this. Cuvier, the great zoologist, who owed his start in the world to Lamarck, regarded his ideas as nonsense, and even ridiculed Lamarck for these views in his burial oration over the great man's grave. Cuvier built up such an enormous reputation for himself, partly deserved, partly sheer self-advertisement, that everyone believed what

he said, and so it became the fashion to ridicule Lamarck's view; Darwin called it rubbish and Lowell satirized it.

Today, however, men are beginning to go back to Lamarck, and there are some scientists, at least, who believe that he was closer to the truth than any of the other great supporters of evolution. There are some points in Lamarck's ideas that are indeed quite laughable. But he may have been right in others, and in any case honor is due to his great and liberal and imaginative mind.

In his day the idea that life, all plants and animals, had never changed one jot but had stayed as fixed as though carven rocks instead of living things, was more thoroughly ingrained in the heads of people than in Darwin's time. As an evolutionist, Lamarck was, then, more of a trail-breaker. Others before Lamarck had guessed at evolution in the process of abstract thinking. Lamarck arrived at his conclusions by observing the facts, by using his eyes and reading the handwriting in the rocks. He reasoned his way; he did not persuade himself.

Lamarck died blind, from too long use of the microscope; he died completely forgotten by scientists of his time; he died poor. At his funeral Cuvier abused his memory vilely; a few spoke in his defense, but no one thought fit to provide him with a decent burial. Like Mozart's, his body was flung into a general trench so that today we know not where his bones rest. No matter, his greatness lives on, and will live.

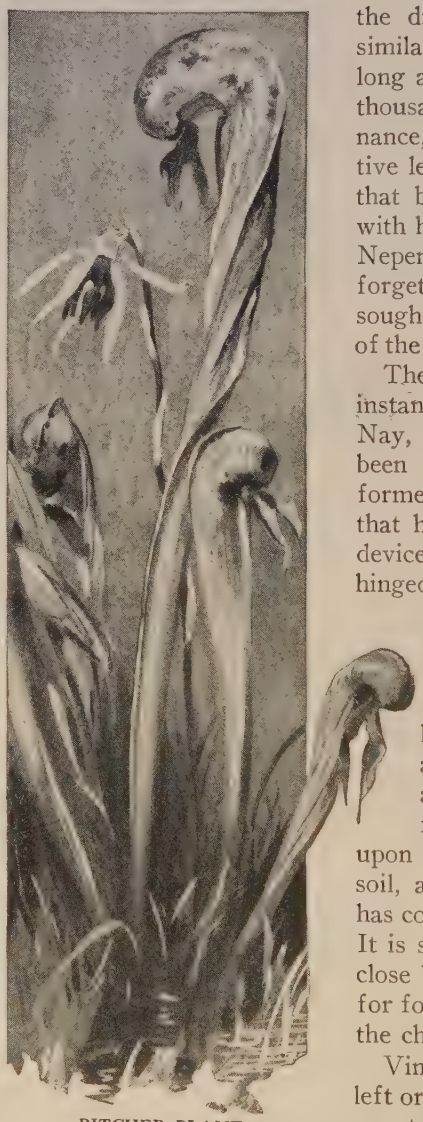
Plants That Catch Live Prey

By Ben Hur Lampman

THE COMMON need of all living things is substance, and the pursuit of this need motivates life. Huxley has called attention, as many another scientist, to the fact that the essential components of the lily and the leopard, let us say, are identical, and that the cells from which they evolved are strikingly similar. Each is bound to the wheel of life, each draws sustenance from the breast of earth, and each in its time essays the elemental return. Understanding these primary truths, there is less of astonishment in the consideration of the pitcher plant. It merely has availed itself of a more direct attack upon plant foods than have its fellows of the forest, and has assumed certain characteristics of the animal.

Other plants thrive upon the foods of the soil, which are largely the product of decomposition, both animal and vegetable—foods that are again reentering the cycle. But pitcher plants, and the nepenthes, seize their prey like any sentient strategist of the higher kingdom, and modify the common rule by appropriating living bodies for their banquets. They do not wait for death to bring them the wastage of life—they enforce death, and hence are carnivorous. In a sense, they are ferocious little exemplars of the kinship of all living things, a unity set at naught by appetite. Chancing upon one the observer may well reflect that there, rooted and leafed, is another such as he, who must eat to live.

An elongation of the leaf of the pitcher plant, terminating in that curious stomachlike structure which is the destiny of many a fly and beetle, is baited with nectar that lures the inquisitive insect—also in pursuit of life. Alas, all those who enter there leave hope behind. For them the chapter is finished. Barred from escape, they struggle helplessly against a treacherous incline and so are plunged into the digestive juices of the pitcher and assimilated without more ado. Long and long ago it was found that this plant, of the thousands of species that strove for sustenance, discovered that an elongated and receptive leaf would entrap nitrogenous food, and that by such an expedient it need not wait with hungry roots for dinner in a barren soil. Nepenthe in the classics is the sweet drug of forgetfulness, such as Helen quaffed when she sought oblivion from sorrow. The nepenthes of the woodland offer forgetfulness, in all truth.



PITCHER PLANT
One of those that seize upon live prey as food.

The Venus flytrap is but another amazing instance of animal instinct in the plant world. Nay, of both flytrap and pitcher plant it has been written, and more particularly of the former, that the observer is inclined to believe that he has encountered consciousness. The device of the flytrap is also a leaf, but hinged, and set with sensitive hairs. Like the pitcher plant, it offers a lure of sweetness. No sooner has the infatuated insect so much as touched one of the fateful hairs than the hinged leaf closes and entombs him, and the digestive cells exude their juices, and so no more of the adventurer. The flytrap opens to cast forth its waste upon the ground, and the waste enters the soil, and between soil and plant Providence has contrived to complete the cycle for a gnat. It is said of the flytrap that, when incited to close by the introduction of a substance unfit for food, presently it will open again and eject the cheat.

Vines that persist in twining either to the left or right, leaves that tremble when touched, vegetation that creeps toward the sun as eagerly as a spent traveler toward water, plants that seize and hold and consume their food—all kinsmen of ours, and with us kindred to the dust.

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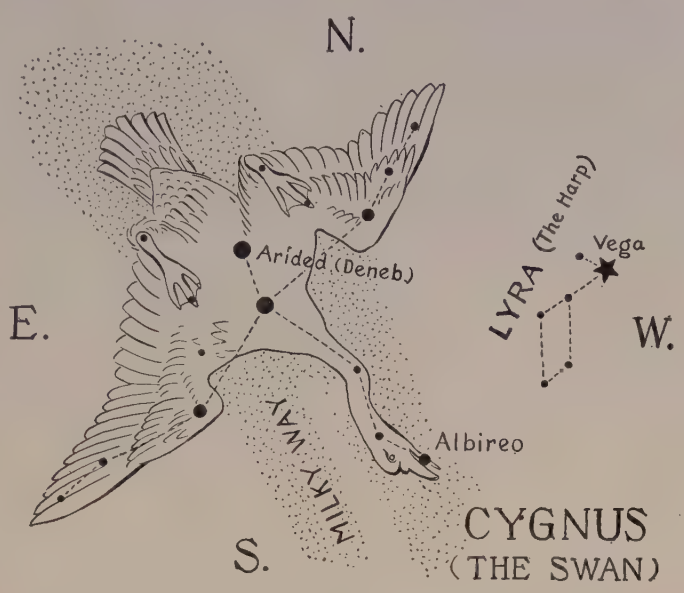
Cygnus, The Swan, and the August Skies

By Isabel M. Lewis

THE CONSTELLATION of Cygnus, The Swan, is one of the most noted and beautiful of the constellations in the northern hemisphere of the heavens, passing directly overhead as it crosses the meridian in latitudes thirty to forty degrees north. In the early evening hours of August it will be found very high in the eastern sky close to the meridian. It may always easily be located by the fact that it lies directly in the path of the Milky Way which stretches diagonally across the evening sky from northeast to southwest at this time of year, and also by the fact that it lies directly east of the small constellation of Lyra, The Harp, which contains one of the most brilliant stars of the northern hemisphere, the magnificent, bluish-white Vega.

The brightest stars in Cygnus form the famous Northern Cross with the first magnitude star Deneb, or Arided, at the top of the upright of the cross, which lies directly along the Milky Way, and the third-magnitude star, Albireo, at the foot. Albireo is noted for the fact that it is one of the most beautiful double stars in the heavens. It is easily separated into two stars, one a golden yellow, the other deep blue, by even the smallest of telescopes. Albireo lies in the head of The Swan, Deneb at the base of the tail.

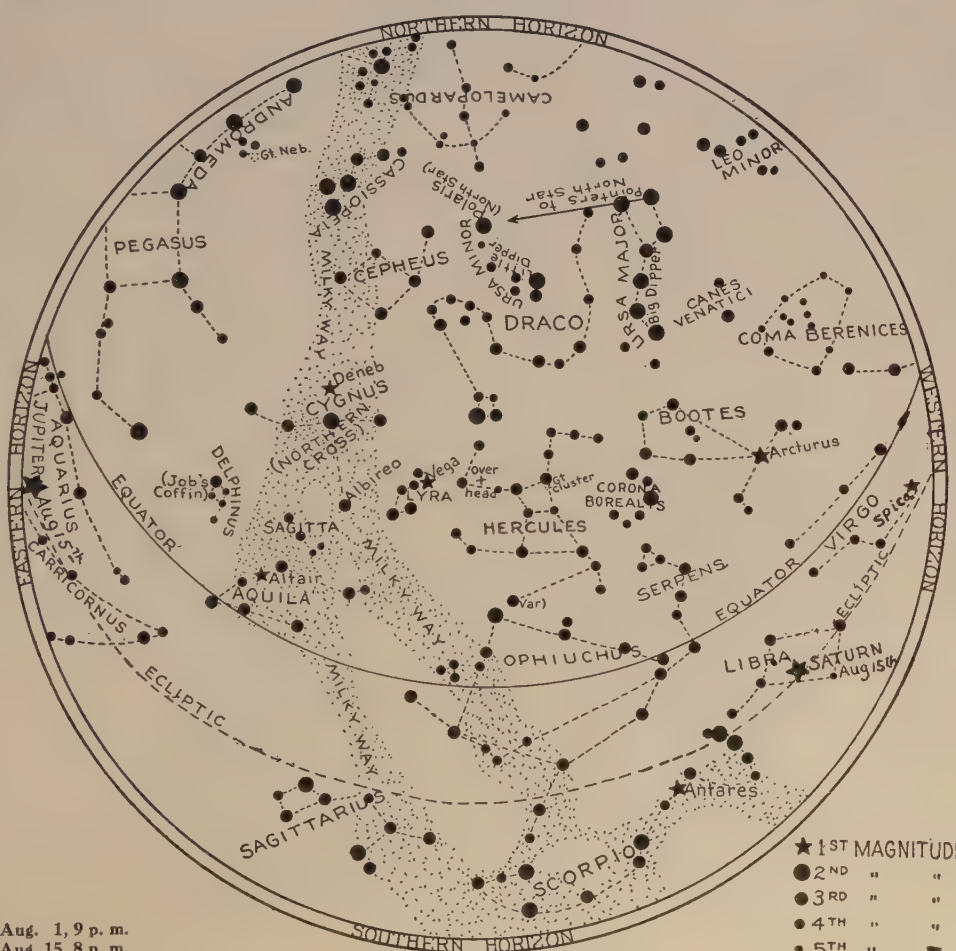
On the left wing of Cygnus lies a small star just at the limit of visibility to the naked eye that is known by the name of 61 Cygni and is noted for the fact that it was the first of all the stars to have its distance from the earth successfully measured. This little star is nearly eleven light years distant from the earth, or about sixty-five trillion miles. There are now known to be at least nine stars nearer to us than 61 Cygni.



ONE OF THE MOST NOTED CONSTELLATIONS
In the early evening hours of August it will be found directly overhead as it crosses the meridian.

Cygnus represents in Greek mythology Cycnus (not Cygnus) the son of Mars and the intimate friend of the unfortunate Phaethon.

Phaethon, it will be recalled, was the son of Phoebus Apollo, and he was cast into the Sky-River, Eridanus, by a thunderbolt hurled by Jupiter on that disastrous occasion when he attempted to drive his father's steeds attached to the chariot of the sun across the heavens, and they became frightened at the sight of the Scorpion and ran away. And so Cygnus was inconsolable at the loss of his friend and lingered continually by the spot where he had disappeared, frequently diving beneath the surface of the river in search of him, until finally he aroused the anger of the gods and they turned him into a swan. This is the swan that we now see in the Milky Way far from the river Eridanus.



Aug. 1, 9 p. m.
Aug. 15, 8 p. m.

TO USE HOLD MAP OVERHEAD WITH TOP TOWARD THE NORTH

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Cygnus lies in a particularly rich and brilliant region of the Milky Way. Here are many interesting double stars, star clusters and dense clouds of stars in far distant fields of the Galaxy. Although one of the nearest of the stars is in Cygnus, there are count-

less others in the same constellations hundreds and thousands of light years away. Deneb or Arided, the brightest star in Cygnus and one of the twenty brightest stars in the heavens, is so far from the earth that its light takes about 650 years to reach us, so we see this star not as it is today but as it was more than two centuries before the discovery of America. Even if one has no telescope it will be interesting to sweep over this constellation with a good field glass or binoculars, which will bring into view a surprising number of stars that are invisible to the naked eye.

One of the best known of the annual meteoric swarms, The Perseids, is due this month with the greatest display occurring between August 11 and 16, inclusive. These meteors are traveling in the same orbit as the Great Comet, 1862, III, known as Tuttle's Comet, which returns to the sun every 120 years. As they are well distributed around their orbit and not closely bunched in any one portion of it, as is the case with many swarms, they give a display of nearly equal intensity every year. The Perseids are yellowish in color and move with moderate speed for such objects and, as their name implies, come from the direction of the constellation Perseus which rises in the northeast late in the evening the early part of this month. As members of this swarm appear in considerable numbers over a period of more than three weeks in August one should see several of them on almost any clear, dark night with best results to be expected the middle of the month after the moon has set.

Two planets will be found in the evening sky this month, Saturn in Libra and Jupiter in Capricornus. Saturn will be in quadrature, or ninety degrees from the sun, on August 13, and will then be due south at sunset. In brightness it is classed among the stars of first magnitude. Though brighter than Altair and Deneb, it is inferior to Vega and Arcturus. This is an excellent time to observe Saturn through the telescope. The Rings are now particularly fine in appearance, as the earth occupies a position of advantage well above their plane, their northern surface well in view.

Jupiter comes into opposition with the sun on August 15 and will then rise in the southeast at sunset and be visible throughout the night. This is the best time for telescopic study of the planet. Its belts, with their varied coloring and shifting form, and its satellites, with their ever-changing phenomena, make it one of the most interesting planets.

Mars, which is now in Aries, rises before midnight and is becoming a remarkably brilliant object as it draws in toward the earth again. By this time it has surpassed all of the stars in brightness with the exception of Canopus and Sirius, and among the planets it is inferior only to Venus and Jupiter. On August 1 its distance from the earth is 74,830,000 miles, and by August 31 will be 60,016,000 miles.

Venus is still a beautiful Morning Star and passes from Gemini into Cancer during the month. Mercury may also be seen as a Morning Star for a few days before and after August 25, when it reaches its greatest western elongation, or greatest distance west of the sun. It will be found then a little north of east, a bit above the horizon just before sunrise.

The Crawfish and His Burrow

THE "CHIMNEY" of the crawfish is merely the entrance to the burrow. Much has been written about the use of this cylindrical structure, but since it is formed entirely of pellets of clay which the digger has brought out during the excavation of the burrow, the most probable explanation seems to be that its construction is the easiest method that the creature has for getting rid of the accumulated dirt, while at the same time it is adding to the length of its subterranean home.

Crawfishes are found in the fresh waters over a large part of the United States and in certain sections of southern Canada. They are omnivorous, feeding on water insects, small frogs and fish, and on some plants. The vegetable portion of their food includes, unfortunately, the tender shoots of various young cultivated plants. Thus in the south, where they are most abundant, they are at times a serious pest. In many places, however, they are harmless and may even be considered beneficial since they furnish food for valuable fishes and certain fur-bearing animals.

PHOTO CORNELIA CLARKE

THE CRAWFISH AND ITS CHIMNEY

These crustaceans are least active in winter, passing that season in rock crevices, in burrows, or at the bottom of springs. They mate in autumn and the eggs are laid in the shelter of their winter retreats. The eggs are attached to the hinder limbs of the mother and are carried about by her for some time. They hatch in spring or early summer, and the young, which are miniatures of their parents, cling to her and are cared for while small and helpless. They grow very slowly and are not mature until about five years old.

Crawfishes are close relatives of the lobster and are eaten in large numbers in continental Europe. In this country, however, though some species reach a good size, they are seldom eaten.—E. A. P.

What is the relative intelligence of a gorilla? Miss Congo, brought back from the Belgian Congo by Ben Burbridge, of Jacksonville, Fla., has offered scientists an opportunity for study in an endeavor to find an answer to this question.

Miss Congo loves Mrs. Burbridge, author of this article and sister-in-law of the captor of this gorilla pet. While there are numerous cases of male gorillas being raised in captivity, it is believed that few females have been reared thus.

"Miss Congo"

By Juanita Cassil Burbridge

WITH a whirring of the engine, the large truck backed up to the porch. From it the driver and his helper lifted a large box—a box with iron bars in front. Through these bars peered a pair of pensive and beautiful brown eyes. There was a wistful wonderment in them, a mute query as to what this was all about. At last the box was unlocked and out came "Miss Congo," who, soon after she had been secured to a porch pillar, reached out her arms to me as does a baby to its mother and then and there made a friend of me for life.

After all, Miss Congo is a baby. She is a gorilla flapper from the Belgian Congo, brought back to the States by Ben Burbridge after two years in the land of the gorillas. And, happily, my brother-in-law entrusted her to me. For several months she has made her home on our place near Jacksonville, Florida, always doing something new, always entertaining. She should really be spoiled because she has drawn many visitors who have come to study her. Scientists have spent many hours with her because a female gorilla in captivity is one of the rarest things in the world.

When first Miss Congo arrived she was a timid baby, apparently afraid of everyone who approached her. Small wonder, for she had come from the mountains just below the snow line to this strange environment. But once installed in a specially built home, with a bed of straw piled high and deep, with large oak trees for exercise, and with plenty of fresh air, Miss Congo soon felt at home.

Her home is equipped with a smaller house—her boudoir. On cold nights she will pull the door of this room shut herself. She will sleep sometimes on her back with her hands under her head. Tiring of this position, she rolls over on her stomach, using her hands for a pillow. Unlike the average child, she is ready to retire when the "sandman" puts in his appearance at night.

Nearly every day, for four or five hours, Miss Congo is brought out under a large oak and fastened, getting a change from her cage. After her lunch, however, she usually wants to go in for a "siesta." At night, after her supper, she generally begs to go in to bed.

One of the questions most frequently asked is, "What do you feed her?" This, naturally, was quite a problem and could only be worked out by experimenting. In her country she lived on pungent wild celery and native herbs. None of our fruit is found there. The cultivated celery here did not have sufficient taste to suit her. She would throw both that and lettuce away in disdain. She liked bananas, but they made her sick. Mr. Burbridge had captured other gorillas, so using his past experience with them he worked out a diet of apples, baked bananas, baked sweet potatoes and sweet milk—of which she drinks about three quarts a day—and oranges. When she came to us I decided to have regular meal hours, notwithstanding the fact that in her native jungle she was nibbling all day, breakfast, 8 a. m.; dinner, 1 p. m.; supper at 5 p. m. is her schedule.

The first part of this year Yale University sent Dr. Robert M. Yerkes down to Florida to study Miss Congo and make psychological tests. He thought that she was getting too many sweets and too much food, so he suggested that we give her practically no lunch except the celery—a little of which she was beginning to eat—and the milk. He also experimented with her foods and found that she would eat certain kinds of crackers, custard—provided it had neither cinnamon nor nutmeg on it—cereals with milk

and sugar, and occasionally a piece of chocolate. So now some of these things are given to her for lunch with her milk and she has the regular food for breakfast and supper. Before eating apples, oranges, bananas or sweet potatoes, she very carefully peels them and throws the peeling to the ground.

Evidently her food agrees with her, for she has steadily grown and, so far, has not been sick a day. We have had to increase the size of her collar and also of her chain three times since last October. At first we snapped her chains together, but that was too easy. She soon learned she could slide the catch herself, and we would find her roaming around the place or hunting new trees to conquer. She never tried to leave the place entirely except once, and then she had seen us drive away and followed the road to the gate. Now we use Yale locks —two of them—one to fasten the chain to the collar and the other around the tree. I am sure that if we let her have the key she would unfasten these.

She has a perfect mania for pulling the hydrants down and tearing the hose, so we have to be careful to see that she is not in reaching distance of these things. When she cannot reach it by using her hands she lies down, and, stretching her leg as far as it will go, she uses her foot. Being able to reach so much farther with her legs than with her arms, it is quite a habit with her to use them.

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SHE PASSED THE TEST OF THE BOXES

Miss Congo found how to reach an orange suspended in air by piling up boxes to stand on.

The span of life for a gorilla is supposed to be about eighty-four years. As Miss Congo is only five years old, she is still quite an infant and does childish things. She is losing her baby teeth and growing fine, large teeth. Incidentally these are a wonderful protection to her. She is not vicious, but when she bites with her entire strength she goes right through whatever she is using for a teething ring. Few people are aware of the fact that the teeth of a gorilla cannot be pulled. They grow so deep that in order to get rid of them they have to be filed off.

Miss Congo's favorite playmate is Betty, our Airedale pup. She spends hours chasing her and wrestling with her. When tired of this she holds her and looks for fleas. It is a question which likes the other the best. Since the gorilla has gotten stronger she hurts Betty when she bites her in her play. In spite of this, Betty cannot be kept away as long as Miss Congo is outside under the tree. Here is where Miss Congo exhibits a very decidedly human emotion — that of jealousy. Both are very fond of me and they are equally fond of each other, but let me show any attention to Betty and Miss Congo will do everything she can to attract my attention. If I fail to notice her she goes away, turns her back and sulks like a spoiled child. It takes a good deal of petting and loving to get back in her good graces again.

Although so young, she has already shown a remarkable mentality. She understands everything that is said to her and, like most children of the present day, does what she is told to do *when she wants* to do so. She loves a crowd. Having found that she can hold the multitude and bring forth their laughter by being cute, she does everything she can do to keep them. When only two or three are left she sits and looks away with an indifference that would be maddening were it not so funny. Her facial expressions are so marvelous that one can almost read her thoughts.

She will play hide-and-seek around the tree with me for

hours and "holler" just as a child would do when I tag her. She has about eight sounds that we have heard her make. When lonesome she purses out her lips, and the cry that she gives is almost like that of a baby. When she sees the food being brought to her she purrs—something like a cat. She is very fond of my husband, but he does not let her handle him as she does me. She sits in my lap, hugs me, kisses me, and never tries to leave as long as I will stay near enough for her to reach me. If she thinks you do not want her to take hold of you she will sit and look off in the distance as if totally unaware of your presence. Suddenly and without warning she makes a grab. If you are close enough to her she gets you and you have hard work getting away until she is ready to let you, for she is as strong as an ox. She loves to get hold of a man's tie and pull as hard as she can. When she finishes he is fortunate if there is even a string left.

It is comical to watch Miss Congo amuse herself with a looking glass. Twisting her head from side to side she looks intently as if trying to figure out whether that is another gorilla or not. Then, with a very sly expression, she nonchalantly puts her hand behind the mirror, as if trying to slip up on something unawares. When she figures that she is just about where the other gorilla should be she grabs quickly. No words can describe the expression of amazement and disgust when she discovers that she has either the empty air or the leg of the person who happens to be holding the mirror.

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WHEN MOVED SHE WILL BEAT HER CHEST

When angry she will thump quite hard, and, when happy about something, will pat her chest gently.

Miss Congo has the most intense dislikes and likes, having absolutely nothing to do with a person she does not fancy. She is exceptionally fond of children and would hug them to death if given the opportunity. She would not purposely hurt them, but she does not realize her own strength.

Gorillas in the forests are known to warn others of danger by beating their chests. Evidently this is a common way of expressing their emotion, as Miss Congo exercises it upon every occasion, beating her breast quite hard if angry, and gently if pleased. When asked to show how much she loves me, she puts one arm over each of my shoulders and beats me on the back. Sometimes she beats the ground or even the limb of the tree.

Some of her features are absolutely human. Her ears are as perfect as any child's. Her hands are like ours, with fingernails and even the heart, head and life lines in the palms. The foot is like ours except the large toe, which is more like a thumb. One day a physician brought his family out to visit Miss Congo. The next day his little three-year-old son insisted on going out to see "dat 'ittle cullud girl in South Jacksonville."

The tests given Miss Congo by Dr. Yerkes impressed him that she had a well-balanced if not brilliant intellect. She solved the problem of the three boxes, for example. Like all gorillas, she likes oranges, and one was hung out of her reach. Three boxes were scattered about the yard. Miss Congo surveyed the orange, grumbled a bit and reflectively scratched an ear. She finally observed a box and cogitated upon it. Suddenly a light seemed to dawn and she dragged the box over under the orange. It was a disappointment to find the fruit still out of reach. More deep thought was followed by the discovery of another box. She hurried after it and piled it on the first. Still the orange hung on high. To add the third box did not take long, and the orange was hers.

She also passed the apple and pipe test with flying colors. An apple was placed inside a pipe that was fastened to the ground, and a long pole was left lying about. Discovering that her arm was not long enough to reach the apple, she lapsed into deep thought. Finally she had it figured out, put the pole to use, and out came the apple.

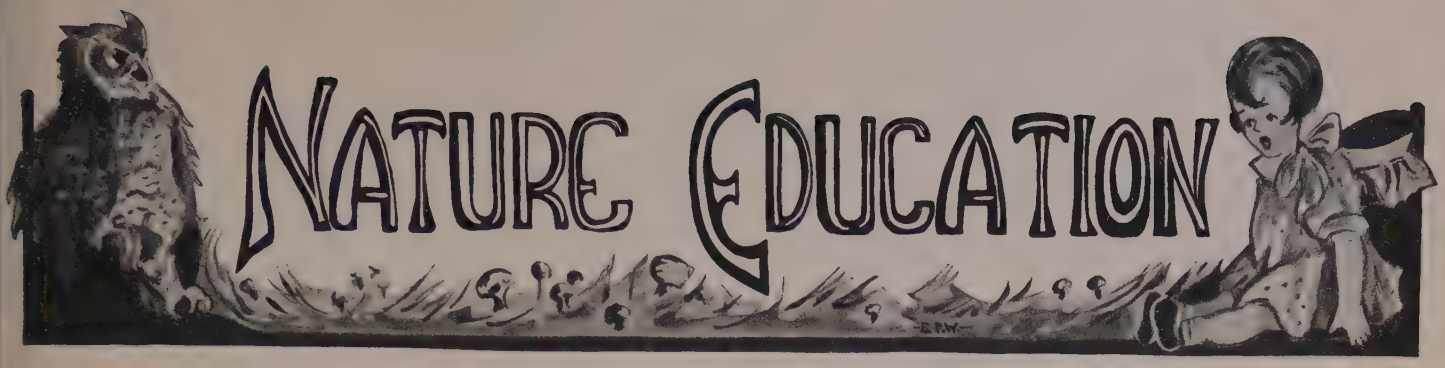
Yes, Miss Congo is a clever pet, with resources without end, with something new almost every day to delight and amaze. And, withal, she is a lovable companion, gorilla though she may be. We look forward to many years of her companionship and believe that the happy chance that brought her to us, through the opportunity she affords for study, will result in lasting contributions of real value to science.

A Few Well-Known or Common Reptiles

By E. Laurence Palmer

Reptiles are of considerable variation in form and habits. The forms selected in the chart below represent most of the major groups and a variety of habits. For example, in the snakes are given one form which lays eggs and one which produces living young; in the turtles are given one form which is most aggressive in nature and one that is most docile. Greater variation could have been attained by sacrificing the intention of having as many as possible of the forms considered, general enough in distribution to be objects of study throughout the United States. It has not been possible to select only forms which may be available to everyone. This ideal has been approached as far as possible keeping in mind the desirability of presenting variety of habits.

Common name Scientific name	Garter Snake Thamnophis sirtalis L.	Milk Snake, a King Snake Lampropeltis triangulum	Alligator Alligator mississipiensis Daudin	Swift; Fence Lizard Sceloporus undulatus Latreille	Painted Turtle Chrysemys marginata Agassiz	Snapping Turtle Chelydra serpentina L.
Where seen	Meadows, roadsides and rockpiles	Under rocks or rubbish, commonly in or near woodland	Uncommon in rivers and lowlands of the southeast	Fairly common in range along fences, in refuse and brush	About ponds, frequently seen sunning themselves on exposed logs	In ponds and sluggish rivers; occasionally in mud flats
Distinctive appearance	Very common, greenish snakes with various stripes of black, with three longitudinal yellowish stripes, belly greenish; scales ridged	Gray or yellowish with broad black-bordered chestnut, brown or reddish bands or saddles; yellowish or red beneath with black spots; scales smooth	Large four-footed aquatic creatures with tough hides, powerful tails and jaws; a 12-foot specimen may weigh in the neighborhood of 500 pounds; loud voiced	Small, active creatures with slender tails and feet; tail brittle; green-gray with black wavy markings on back; body covered with scales	Upper shell about 4 x 6 x 2 inches; dark olive with red on sides; lower shell yellow and fairly well covering body; neck and head yellow marked; male with the longer tail	Back with three broken ridges and with coarse scales; under shell not covering body well; head with very powerful jaws and ability to strike swiftly
Distinctive habits	Rather active, of variable temperament, frequently ill-smelling; found in companies often; generally satisfactory pets	Variable in temperament; generally splendid pets; occasionally chew while biting; are dropped with difficulty	Wary of man though fight when cornered; use tail and jaws as weapons of offense and defense; remain quietly on bank or under water	Movements very quick and erratic; dart away from enemies or after prey with incredible speed; able to climb with ease	Gentle, docile, rather helpless creatures making ideal pets if independence is not desired; generally interesting	Treacherous creatures with power to inflict serious damage when large; interesting when young because of aggressive natures
Characteristics	Non-poisonous	Non-poisonous	Dangerous when molested	Neither dangerous nor poisonous	Not poisonous or dangerous	Dangerous but not poisonous
Size	About 36 inches	Up to 42 inches	Up to 12 or 14 feet	Up to 10 inches	10-inch maximum shell	Up to 24-inch shell
Food	Frogs and toads, earthworms and occasional other forms of animal life	Mostly small rodents like mice and rats; eat other snakes	Fish, birds, mammals and other forms of animal life; captured alive	Insects and other small invertebrates captured alive	Water plants and animals, including living or dead fish	Almost any living animal matter worth capturing and able to be captured
Method of attack	Crush with jaws or hold in mouth and pound on ground	Kill by coiling body about victim or swallow whole	Capture from beneath water or knock down with tail; eaten above water	Captured by sudden darting	Capture and eat under water; pulled apart with jaws and feet	Captured and eaten under water; tear or cripple with jaws
Protection	Escape or hide; may strike in defense; sticking out of tongue is inquisitiveness		Escape or fight; size and power compel respect	Escape or hide or occasionally shed tail when necessary	Escape or hide under water in mud; retire into protection of shell	Escape or hide; ability and willingness to fight powerfully
Eggs	Gives birth to living young generally late in summer; mates in late spring; brood may number 16 to 50; does not swallow young to protect them or for other purposes; young like adult in appearance and activity but naturally smaller	Lays from 8 to 20 soft, white, leathery eggs, ⅛ to ½ inch in size in damp soil; these hatch in about 7 weeks into young like the adult, about 7½ inches long and with redder patches; eggs laid from July to September	In early summer female lays 30 or more eggs in conspicuously constructed nests of decaying plant matter on shores of waterways; eggs like slender hen's eggs; young like adults except in size; young grow rapidly, may mature at around 6 feet in five years	In midsummer female lays 5 to 10 or more whitish parchment-shelled eggs in warm place and leaves them to shift for themselves; young essentially like adults except in size	In June or July lays from 5 to 8 long, blunted, egg-shaped eggs, 1⅛ by ⅝ inches in size in stumps or logs near water's edge; these hatch into young resembling the adult except in size; shell of egg smooth, soft and with a glaze; young shift for themselves	In June or July lays from 20 to 24 nearly spherical eggs which are white with a thin, hard shell and about ⅞ inch in diameter; these are laid about 5 or 6 inches under loose damp soil away from the water; the young are like the adult and shift for themselves
Range	The commonest snake found in the United States probably; this species or its subspecies occupy practically all of the United States; with its closely allied species occupies the whole of our country	This species and its subspecies found from northwest Mexico to Virginia and north through Iowa and Massachusetts; other closely related species found elsewhere in the United States except in the northwest	Becoming rare in wild state though is grown in captivity; found in inaccessible swamps and riverways of the gulf states; probably most large individuals killed off	This species and closely allied species found from Atlantic to Pacific and from New Jersey to Oregon and south through the United States; habits of closely allied species generally similar	One of the commoner turtles of the United States; this species and its subspecies found from Vancouver Island to New England and south through lower Mississippi Valley	This species is common in North America east of the Rockies from Canada to the Gulf of Mexico; it is closely or rather closely related to the alligator snapper of the Gulf States which reaches a weight of 120 pounds and a length of 3½ feet
Use to Nature	Controls the multiplication of the forms of life composing its food; serves as food for a number of birds and mammals	Controls the multiplication of many rodents and snakes and serves as food for its enemies	Serves as control of forms which enter its diet and in youth serves as food for enemies	Serves as a factor in controlling multiplication of insects and other small invertebrates also as food for enemies	Serves as a general scavenger for ponds in which it lives, removes dead animal matter which might otherwise contaminate the pond	Serves as a most effective control of medium sized forms of animal life in region which it occupies
Use to Man	Probably is not valuable to man if weighed impartially in the balance since most of the forms of life making up its food are useful to man	Probably one of the most useful of snakes; destroys large numbers of rats and mice and other snakes; is supposed to milk cows, but this of course is not true; is also supposed to have a poisonous "stinger" in its tail, and this is not true; sometimes called "spotted adder"	Probably valuable for hides; sometimes dangerous; hides used in leather work such as suit cases and pocketbooks; probably doomed to be limited to reservations and alligator farms; shot promiscuously and needlessly for "sport" and then abandoned	Very useful destroyer of insects and their immediate kin; make interesting and playful pets if kept in reasonable confinement; will breed and lay eggs in confinement though not always	Probably of no great value to man except as specified above; it must be interesting or it would not appear so commonly as a pet of children or as an inhabitant of indoor aquaria	Destructive of waterfowl and fish and for this reason hardly to be desired by man; fortunately also makes very good food, particularly in the form of soups; probably is able to maintain its own without great difficulty and so does not need protection necessary for other forms of turtles of great food value



PROF. E. LAURENCE PALMER, CORNELL UNIVERSITY, DIRECTOR

ASSOCIATES

Prof. George R. Green, President, American Nature Study Society.

Prof. J. A. Hollinger, President, National Council of Supervisors of Nature Study and Gardening.

Mrs. Elizabeth K. Peeples, In Charge of Nature Study, Washington, D. C., Schools.

Prof. L. D. Wooster, Kansas State Teachers College, Hays, Kansas.

Miss Clelia Paroni, Supervisor of Nature Study, Berkeley, Calif.

Dr. Bertha Chapman Cady, Girl Scouts of America.

Plant Workers to Meet

The first International Congress of Plant Sciences will be held at Cornell University, Ithaca, New York, from August 16–23, 1926. The most eminent workers in the respective branches of plant science have been invited to read papers, the presentation of which will be limited to a fixed portion of time, the remainder being devoted to round-table discussions, excursions, etc.

Everyone interested in any of the fields of plant science will be admitted to the Congress on payment of the registration fee of $5. Visitors will be housed in university buildings at a nominal rate for board and room. Anyone desiring a preliminary announcement of the Congress giving full details as to program and accommodations should address the chairman of the Executive Committee, Dr. B. M. Duggar, National Research Council, Washington, D. C.

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Bird Study in Berkeley

A fifth grade room in the Hillside School in Berkeley recently became very much interested in bird study and formed a Junior Audubon Society. During the entire semester the work of the class in literature, music, and art was centered about bird life. A recent program consisted of bird songs, original poems, and original stories about birds. An exhibit of pictorial designs based on Japanese bird prints was particularly attractive.

* * *

Work in California

The California Fish and Game Commission has long supported an educational department. During the past year this department has been unusually active owing to better support. A program of lectures illustrated with motion pictures is being furnished all schools which apply, and loans of lantern slides, films, and specimens are also made. A quarterly bulletin entitled *California Fish and Game* goes to every high school in the state and is widely used by biology and nature study classes. A series of teachers' bulletins is also issued. Every opportunity is being utilized for aiding boy scouts, camp fire girls, and girl scouts in their nature programs. The Commission actively supports the nature guide program in the National Parks and their director of education has charge of the work in Yosemite where last year 50,000 persons had conservation lectures and nearly 10,000 were led afield to study living things first hand. This coming summer additional summer resort educational work will be instituted in California State Redwood Park in Santa Cruz County. A School of Field Natural History established in Yosemite National Park trains students who in the future will help enlarge the educational program.

WHO'S WHO IN NATURE STUDY

Alice Jean Patterson

Miss Alice Jean Patterson, Director of Nature Study, Illinois State Normal University, and former president of the National Council Supervisors of Nature Study and School Gardening, says of her Nature Study interests—

"I think my interest in Nature Study began when I was a child on my father's prairie farm. I recall the pleasure that I derived from studying flowers and water life. Natural History courses and their accompanying field trips, taken while in Chicago University, proved to be of outstanding value to me in my nature work.

"Even as a teacher of Biology in high school, I find, as I look back on my work, that I used the Nature Study method of attack. I did this on my own initiative because I found more enjoyment in helping my pupils to get acquainted with the life in their environment than in using textbooks."

* * *

A Detroit School Garden

The experimental garden at the Brady School, in which the children do the actual work and planning, was a new idea in Detroit. The results have proved that children can successfully carry out such a project. Besides sod, flower borders, rose trellises, a wildflower bed, hedge, and shade trees, there are in the garden a sun dial, sun house, and martin house. Other departments cooperated with the Science Department in the work.

* * *

Nature Puzzles

The boys of the New Jersey State Home for Boys at Jamesburg publish an interesting little weekly paper and so active is their interest in Nature that it includes a Nature puzzle. W. L. Symons is principal.

HAVE YOU A NATURE CLUB?

By Lulu S. Van Horn

HAVE YOU a Nature Club in your town? We have many clubs but the Nature Club is one of the most valuable and successful. It is serious in its work. It broadens the outlook, widens the horizon, breaks the monotony of busy lives. More than that we learn to love the birds and attract them, to wonder at the butterfly and study it, to marvel at the intelligence of insect life and watch it, to care for flower, shrub and tree as for a friend.

Ours is a twelve-month club, meeting every two weeks during the winter in our club rooms and every week in the summer out of doors. We have thirty-five members. The club rooms are downtown in the business section Here are a good library, cases of butterflies, moths and insects, wild flowers and weeds, mounted birds, some minerals and a few good photographs. A part of the club work is to collect, classify and preserve specimens. Work is done from a study program, each member preparing a paper or giving a talk. In the summer every week, two members arrange for the field days, choosing the place to be visited, arranging transportation, furnishing coffee, each member bringing his own lunch. These are heavenly days out in the open! All the beauty spots, lakes and woods in the county have been visited time and again until we are familiar with the birds, flowers and trees of each. We know the very place the meadow larks assemble to carol the arrival of spring days; the "Willow Walk" where the willows, close to the walk, are filled with the migratory birds on their way farther north; the orchards made gayer at blossom time by the flashing orange and rose of oriole and grosbeak, by call of catbird and song of wood thrush. Excursions abroad are frequently taken for special observation and study.

Sometimes an authority is brought from the University to talk to us or one of the lecturers from a Normal School is invited to study with us and explain life in pools and stagnant waters where beetles and darning needles are hatched. When astronomy was taken up the observatory was visited for views of "sun, moon, stars and Milky Way." Trees, weeds, flowers, ferns, astronomy and geology have been subjects of study. The club has become an authority on butterflies, wild flowers and weeds. We have a rare collection of moths and butterflies and a new variety of the latter was discovered by one member and named in her honor by a state authority. Nearly all of us are familiar with a half hundred birds, and wayside flowers and weeds are old, familiar acquaintances, both scientific and common names being freely used. Birds, butterflies and flowers are the most popular subjects, perhaps because they can be seen at our own doors. We have learned that to have a garden and love it is not just to own a plot of ground where some flowers bloom to adorn or to be cut for the vases of the house, but a place in which to marvel, to reverence, from which to obtain wisdom and understanding. Reading, writing a paper, studying a chart are very different from seeing the object itself, watching the robin, wren or oriole build its nest, feed and train its young, know their carollings and calls; different from studying the habits of a flower, its foliage, buds and bloom, its odor and beauty, all developing into seed cup or pod. The marvel and wonder of it sometimes overwhelms us. We do not pretend to study scientifically at all times but we do add to our understanding, our appreciation of Nature.

As students and lovers of songbirds, we plant trees and shrubs to attract them in summer, put up feeding shelves to help them in the winter. When snow and ice come, we give them nuts, crumbs, sunflower seeds and suet. Melon seeds are dried in the summer. The birds love these ground up with peanuts. From my window now can be seen the jolly nuthatch. He is so nimble and sure of himself. Up and down a nearby tree, head down as often as up, round and round the trunk; then at the shelf cracking seeds. The friendly chickadee, both hairy and downy woodpeckers, the brown creeper and blue jay feed on the shelf, too. Winter is a good time to study these birds and note individualities. Club members try to keep a record of birds seen during each year and to know the song and kind of nest as well as the shape and color of each.

We are fortunate in having woods and river right in town with many small lakes and quarries nearby. Wild flowers have grown in abundance at all these places but are scarcer each year. People cut down the trees, burn off the growth, while children, young and old, pick the flowers, pull up the roots, so that there are fewer and fewer. It is a part of our club work to protect these wild flowers growing so near us, to urge the setting out of trees; we wish the European custom of planting a tree for every one cut was observed here.

Members of the club are always ready to help the community. One year the tussock moths did great damage to the shade trees. Our club gave talks in the schools and distributed circulars to aid in destroying the plague. We have a state flower, but it was one of our members that suggested a community flower. It is a worthy idea. It would beautify any town to have masses of some one flower blooming along the boulevards, at bus and rail stations, in school grounds as well as private gardens. This is another piece of work our Nature Club looks forward to.

We might be induced to give up other clubs but the Nature Club is too valuable, too wide in its scope, too great an influence in our lives. Through love and understanding of Nature, our hearts leap up when the first robin comes to our door, the first hepatica is found under the dry leaves, the first pussy willows to tell of earth's resurrection. Thus we are led into intimate relation with beauties all about us.

How to Form a Nature Club

The American Nature Association has received numerous requests for suggestions as to how to form a Nature Club such as is described in this article by a member of the Minneapolis Nature Club. In response to this demand a special bulletin containing helpful suggestions and a model constitution has been prepared. This bulletin will be sent on request. Ask for Bulletin 25, "How to Form a Nature Club."

SNOWY MOUNTAINS UPSIDE DOWN

The surrounding waters make perfect mirrors to reverse the order of the majestic heights.

A Botanist at Glacier Bay

By WILLIAM S. COOPER

The most notable recent addition to our National Monuments is that of Glacier Bay, Alaska. This glorious region has been set aside by presidential proclamation as a result of an active sentiment expressed by conservation organizations. The movement to this end was in considerable measure based upon the recommendation of Dr. Cooper, author of this article, and professor of botany at the University of Minnesota.

ONE DOES not ordinarily think of wild strawberries growing next door to a glacier. But Alaska is full of contrasts and paradoxes, and the size and quality of its fruits and flowers are among the delightful surprises that greet the visitor. These strawberries, for instance, are not the insignificant little things of our fields and woods, but great luscious fruits as large as those of the garden and infinitely better flavored. It is pleasant to recall a certain island in Glacier Bay. One climbs its steep sandy bluffs to the willow-clad plateau; the bushes drip with recent rain; coveys of foolish, trustful ptarmigan rise suddenly into the air, almost from under foot. The surrounding waters make a perfect mirror in which the counterfeit presentment of the snowy mountains hangs upside down. Glistening icebergs drift silently by; occasionally one finds itself stranded upon the beach below, fated to sojourn there until the next tide gives it liberty. With strawberries in mind, we direct our course toward a broad eminence where the willows grow thinly, and shortly we are in the midst of them. The orgy begins—let us discreetly draw the veil, merely pausing to make record of the fact that in an hour, one September day, four scientific visitors provided themselves with the wherewithal for strawberries and cream, strawberry shortcake, strawberry omelet next morning—and what was left went into strawberry jam.

WEATHERED STUMPS ON THE BEACH

These are relics of the ancient forest that once clothed the shores of the bay and now stand stark and bare.

If animal food be preferred, it is there in abundance and variety. Enormous crabs live in the shallow waters, each individual yielding several pounds of delicious meat. One may

wade into a stream and seize the makings of a salmon steak in each hand. Here, however, the mere human feels himself to be no better than a poacher upon the preserves of the ancient and rightful owner, whose claim to the fishing privilege is clearly shown by the trampled grass along the margin and the half-eaten carcasses lying here and there. One may almost persuade one's self that the great round footprints leading off into the brush are more heavily impressed than those pointing toward the stream bank. Feasts and orgies seem to be in the very nature of things at Glacier Bay.

All these extremely unscientific details are merely for the purpose of demonstrating that the hard-working days of the botanical explorer are plentifully sprinkled with luxuries not easily obtainable within the bounds of civilization. I had almost spoken of them as compensations, but in such a land of beauty and wonder, compensation, other than the work itself, is utterly superfluous. In the observation of natural objects there is a very great joy. When one may watch the things of Nature in a state of change—see them develop from simplicity to complexity, from youth to maturity, the interest is multiplied manyfold. The fascination rises to a climax when, through painstaking observation and the exercise of that fine and useful instrument, the scientific imagination, the bygone history of a region, of its rocks, its plant and animal life, is brought again to vivid life.

THE MIGHTY MUIR GLACIER

This is the most famous of the ice rivers of Glacier Bay, with its many marvels.

Such has been our opportunity at Glacier Bay. The story of the last few centuries lies spread before one like an open book. Sailing up the bay, we see the mountains at first rising densely forested from water's edge to timberline. But at an altitude of a thousand feet there is a sharp division. Above, the trees are huge and gnarled; many dead trunks are visible; the tone over all is dull bluish green. Obviously, the forest here is ancient. Below, the color is fresh yellow green, the trees—all spruces—are young, spiry individuals, closely placed but clothed with branches to the very base, and all vigorously alive.

To one familiar with the ways of glaciers and the bits of evidence they leave behind them the explanation is easy. These mountains were once covered from base to timberline with forest like the ancient type still existing high up the slopes. Some centuries ago, upon the mountains far to the north, the snows increased, the temperature grew colder. Glacier tongues crept down the valleys. In time they reached the level of the sea and merged in a mighty mass which filled the bay and rose high against its mountainous bounding walls. Down went the forest before its irresistible attack. The slopes were swept clean as high as the ice extended, but above this line the forest was unscathed. Another climatic change, bringing higher temperature and less snow, and the great glacier began to shrink. As it retreated up the bay it receded from the mountain slopes, leaving them stark and bare as far up as its maximum limit of invasion. That retreat is still in progress. The glacier that once filled the bay is gone; if we follow the fiord-like arms to their ends we will find in each the terminus of one of the tributaries that formerly joined to form the whole. They are majestic still, and give birth to fleets of icebergs, but they are insignificant in comparison with the mighty frozen torrent of half a dozen centuries ago. Glacier Bay had a history of great beauty.

As our gasboat carries us northward, parallel with the steep mountain front, we note that the ancient high-level forest continues for a number of miles in the form of an ever-narrowing wedge, finally ending in a point—where the descending surface of the ice at its maximum intersected the upper limit of the forest. The lower slopes, stripped and scoured by the ice, exhibit plainly the process of reinvasion by the army of plants. We have already described the youthful but luxuriant forests which clothe the slopes first vacated by the ice in its retreat. Even here the length of time since the departure of the ice is a scant century and a half.

Northward, we pass to successively younger stages. Before forest can establish itself, the way must be prepared by humbler types of vegetation. Alders and willows must enrich the soil and provide shade. Under them spring up the seedlings of spruce, which ultimately grow into tall trees and, through the shade they cast, ungratefully bring about the death of the shrubs which nursed their tender youth. In justice it must be said, however, that those shrubs did the selfsame deed to *their* nurses, the lowly herbs and creeping shrubs which are the first hardy invaders upon barren rock and soil. Before us then are the successive stages in the process. We have surveyed them in reverse order; forest, willow-alder thicket, lowly pioneers, then bare ground—and the ice itself.

The feature of greatest interest still awaits us. A weathered stump projecting from the beach is our introduction—not an especially promising one, until we find others like it, singly and in groups and companies distributed along the shores of the bay. Here one stands isolated, surrounded by salt marsh; there, a group upon a rocky ledge high above the water; again a row of them just in the process of being washed out of the gravels that partially conceal them. These are the records of that ancient forest that once clothed the mountain slopes, five hundred, perhaps a thousand years ago, whose reign was ended by the great ice invasion. And most satisfactory records they are. Let us undertake a somewhat minute examination of one of the best

of the deposits. In the midst of a high bluff of gravel appears a dark horizontal line, the old forest floor. Stumps are rooted in it, the trunks extending upward to the soil surface, where they were smoothly sheared off by the moving ice. The ancient trees are numerous enough to tell us something of the composition of the forest, examination proving it to have been half spruce and half hemlock.

Collecting some of the material from the ancient forest floor, it is evident at once that it includes mosses and other herbs, spruce cones and wood fragments. Careful washing away of the silt brings a surprising result. The mosses which were alive at the time of burial stand up straight, stiff, unharmed. One is almost convinced that they are still alive, in spite of the centuries of entombment beneath tons of gravel and ice three thousand feet thick. The explanation is, after all, quite simple. Here was a side ravine, luxuriantly forested. The advancing glacier closed up its mouth, a pond formed between ice and mountain submerging the lowly forest plants, and the load of silt, which glacial water always bears in suspension, gradually and gently sank to the bottom, embedding the mosses in their natural position and doing them not the slightest violence meanwhile. The microscope here reveals to us recognizable fragments of thirteen species of mosses, of ground pine and various other plants.

There is not space to tell of the glaciers with their spectacular walls of ice, vivid blue and glistening white; of the crash and roar of new-born icebergs, Nature's noblest music; of the climatic magnificence of Mt. Fairweather, three miles high—and looking its height. Mountain, glacier, water, forest, animal life combine to make an ensemble unexcelled, worthy of the distinction conferred upon it by President Coolidge, who has created here the "Glacier Bay National Monument," to be forever preserved as an outstanding exhibit in our great outdoor museum of the wonders of Nature.

ASSOCIATION'S EXPEDITION HAS NARROW ESCAPE

AFTER a battle for their lives in the breakers off Unimak Island, Alaska, in which some of the equipment of the American Nature Association's expedition to the Aleutian Islands was lost, the party landed on July 7 beneath a belching volcano.

Those thrown in the raging ocean while the Shishaldin Volcano belched flames and smoke were Campbell Church, of Eugene, Oreg., owner of the steamer *Westward*, Captain Grove and Engineer Hankins. In the following boat, beached farther away, were William L. and Irene Finley, field naturalists of NATURE MAGAZINE, Betty Church and Campbell Church, Jr. Dr. Gilbert, the expert of the U. S. Bureau of Fisheries, is another member of the party.

Word from the Association's expedition reached Washington after most of the August issue had gone to press. By last minute changes the members are here given but a scant idea of the thrilling experiences of the Finleys. These are but a foretaste of what is to come.

A telegram from St. Paul, Alaska, signed by Mr. Finley, says:

"We discovered Shishaldin Volcano on Unimak Island belching steam and smoke at night. Top of mountain glows as flames shoot up from the crater sides of volcano robed in snow. Makes spectacle of unusual grandeur early in the morning.

"Camera equipment and provisions were loaded in small boats to make camp at base of volcano. The motor canoe led the way to land at mouth of a river but was swept over a reef by the wind and treacherous current. Three men were swamped in breakers, boat turned turtle, and the three struggled for their lives unable to hang on in rough water.

"Profiting by their experiences the other boats were worked further along shore and made a safe landing through the breakers. Then came the difficulty of rescuing the men in surf who were being swept down the coast line. They were finally brought in exhausted after a battle in the icy waters. Part of supplies and equipment lost. A bonfire in protected place restored Campbell Church, Captain Grove and Engineer Hankins.

"Bogoslof, most remarkable volcano in the world, with well-established record of pushing peaks up out of the sea at regular intervals or swallowing them up again, has for the first time been carefully studied and photographed by the American Nature Association's expedition just before the accident. The yacht *Westward* was cruising along the Aleutian Chain in the Bering Sea when we approached Bogoslof. The island lies in uncharted waters in the deepest part of Bering Sea. The boat nosed cautiously about the steaming island taking soundings for hidden rocks and reefs and made her way into a small circular bay on the west side. Her anchor was dropped into the very crater where the water was sulphur color and warm under the spot where we stayed uneasily for two nights and two days.

"In 1907 McCulloch's Peak blew up and dropped out of sight but half of Metcalf Peak remained. In 1909 Metcalf Peak disappeared and new peak came up in the center of the island. Later in the same year the new peak burst into flame and spent itself in cinders, ashes and smoke.

"No plant life has been able to find room on the island but in spite of all the volcanic action we find Bogoslof has likely the largest colony of Pallas Murre, a sea bird, and sea pigeons and the biggest sea lion rookeries in the north. Two large rocks, several acres in extent and several hundred feet high, remain on each end of Bogoslof. Here sea birds live about steaming holes in the ground and being disturbed they started up sending flying rocks and shale upon the camera men, who jumped for safety.

"We found steaming pits and ovens of hot rocks for cooking purposes and a lagoon for hot sulphur baths."

IDLE LAND BEING PLANTED BY BOY SCOUTS

Cayuga County, New York, Doing a Big Job in This Regard—Memorial Highway Planting Going Forward in Wisconsin

LOOKING ahead as all tree planters must do, The Boy Scouts in Cayuga County, N. Y., have under way a 250-acre planting campaign. Nearly 300 boys have joined the American Tree Association, the registrations in the tree planting army having been attested by A. S. Walker and T. R. Brining. The Scout leaders are using the Forestry Primer in their summer camp work. Anyone can have a copy of the Primer by sending a stamp to the American Tree Association at Washington.

* * *

In Wisconsin the Road of Remembrance idea is being pushed by the American Legion along Trunk Highway No. 13. L. A. Zellmer of Marinette reports, to the American Tree Association, interest in the Legion campaign for a memorial drive the length of Highway 13 is growing fast. Practically every Legion post on the trunk in Ashland County is working on plans for planting trees and it is expected that within the next three years the entire length of Highway 13 within Ashland County will be bordered by elm trees.

* * *

Pupils of the schools at Piedmont, Ala., have written papers reviewing the Forestry Primer as their part of the program for marking 1926, the semi-centennial of the first step in forestry by the U. S. Government, and J. Orlando Ogle has sent some of the best ones to Charles Lathrop Pack, the president of the American Tree Association. They are written by Elbert Webb, Gussie Williams, C. T. Reedy, Harmon Posey. This good work has been done in hundreds of schools throughout the country and will be resumed again in the fall.

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The Forestry Primer is now going out through the traveling library system at Madison, Wisconsin, to rural sections of the state. Miss H. C. Long, in charge of the work there, finds a keen interest in anything having to do with forestry education.

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Through Fred W. Leu, Farm Editor of the *News-Bee* at Toledo, Douglas Fir trees were obtained from the slope of Mt. Edith Cavell, Jasper Park, Alberta, and planted on the court house grounds, to be used, when grown, as permanent Christmas trees. At the planting ceremony, which was in charge of the Lions Luncheon Club, of which Leu is first vice-president, the Canadian Government sent Colonel Samuel Maynard Rogers, Superintendent of Jasper National Park, to Toledo, as the speaker. For the purpose of bringing to the attention of city folks a practical demonstration of the need for reforestation the University of the City of Toledo turned over a 20-acre tract of its campus for the purpose of a forestry demonstration field. Through Edmund Secrest, Ohio's state forester, some 1,500 trees, of different varieties, were planted. They were placed under the direction of Dr. J. H. Bowman, professor of botany. The project found its instigation in Leu, an alumnus of the institution.

Memorial Parkway For War Mothers

On September 17, Constitution Day, at Fraunces Taverns in New York City, Articles of Incorporation of the Washington Highway Federation will be signed. The American Memorial Parkway Federation of which Daniel P. Sullivan is president, sets the aim of the project as one "to advocate and promote the establishment and maintenance of a Memorial Parkway for the perpetual commemoration of George Washington, the illustrious founder, and the valorous defenders of the American Nation; and in dutiful recognition of the consummate sacrifices of American War Mothers." Colonel Sullivan has sent invitations to the General of the Armies, American Society of Landscape Architects, The American Tree Association, American War Mothers, American Legion, Veterans of Foreign Wars, United Spanish War Veterans, Grand Army of the Republic, Disabled American Veterans, Reserve Officers Association, American Battles Monuments Commission, U. S. Commission for Celebration of the Two Hundredth Anniversary of the Birth of George Washington, Sons and Daughters of the American Revolution, U. S. Marine Corps, American Institute of Architects, American Association State Highway Officials, National Conference State Parks, National Parks Association, and The Automobile Club of America.

Boy Scouts of San Bernardino and Redlands are hard at work in the reforestation program in the San Bernardino National Forest. The report of the work is made by G. S. Walker, scout executive, and S. A. Nash Boulden, Forest Supervisor. All tree planters have been sent memberships in the tree planting army.

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In memory of her father who planted many trees in 1876, Gertrude B. Prindle, county school commissioner of Charlotte, Michigan, gave each of the 140 schools in her county white pine trees. The program was particularly appropriate as 1926 is the semi-centennial of forestry in this county. The planting inspired the placing of other trees on the school grounds.

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Grand Rapids Camp Fire Girls claim the first Camp Fire Forest. They have just planted 10,000 white pines on the Muskegon River in Newago County, Michigan. In addition 1,000 trees were planted on the camp property in Ottawa County. The planting was under the supervision of Frank L. DuMond, Curator of Education at the Kent Scientific Museum, and Lucien Palmer, Kent County forester. The tree planters have registered their work on the national honor roll of the American Tree Association, through Marion P. Teal.

* * *

Idle land is being put to work in Ohio. The Central Ohio Anglers and Hunters Club, of which Paul Mason of Columbus is president, is primarily a conservation organization, rather than merely a fishing and hunting club. Every one of the 350 members is pledged to the "conservation, propagation and protection of fish and game"; to "encourage the planting of trees, support a sound forestry program and promote the reforestation of waste lands everywhere." The members are expected to plant trees individually, and the club's minimum program is 100 trees a year—and "plant 'em yourself." Members are making surveys of waste lands on farms in Franklin County. Then they ask permission of the owners to go in and plant trees, the only restrictions being the trees shall be protected against damage by stock and that club members shall have access for purposes of inspection, in order to report conditions. Mr. Mason expects 100 per cent registration in the American Tree Association this fall.

* * *

The High School Forestry Club at Walden, Colorado, reports good work under the direction of J. M. Scoville. The tree planters work in cooperation with the Extension Division of the State Agricultural College at Ft. Collins.

* * *

Now is the time to make your tree planting plans for the fall season. The American Tree Association, 1214 Sixteenth St., Washington, D. C., for a stamp will send you tree planting suggestions. Every organization should put on a tree planting campaign this fall and join the tree planting army.

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NATURE NEWS AND VIEWS

Makes New Finds

Charles W. Gilmore, Curator of Vertebrate Paleontology of the United States National Museum, found his trip to the Grand Canyon this year to be under a happy star. He has brought back a number of entirely new and, in some cases, quite baffling specimens of fossil tracks from different levels of the canyon. Among the new tracks appears to be one of an animal with eight legs and sixteen toes, and in addition to tracks several fossil leaves and prehistoric insects were found. Mr. Gilmore considers this collection the best yet taken from the canyon region. His previous discoveries were described in the June issue of NATURE MAGAZINE and a series of short articles on restorations from the footprints is now running. The article for this issue is on page 91. Mr. Gilmore is a member of the Scientific Consulting Board of the American Nature Association.

Guides in Redwoods

In furtherance of California's Fish and Game Commission's educational program, plans are being laid to start a nature guide service in the California State Redwood Park. J. B. Newell, Fremont High School, Los Angeles, a graduate of the Yosemite School of Field Natural History, and Miss Emily Smith, another graduate of the school, have been secured to give lectures and conduct field trips in the Big Basin this coming summer. Wild life films of the Fish and Game Commission will be shown regularly.

Under the Microscope

Nature offers many fascinating fields for study but one of the most fascinating is, generally speaking, the most neglected. This is the field of the minute forms of life which must either be placed under the microscope to be seen at all, or can only adequately be observed through this medium. It is also interesting to examine the details of a larger object under the lens. Perhaps one of the reasons for the comparatively restricted use of microscope study by the layman has been the lack of an all-around, reasonably-priced and yet efficient microscope. Recently there has been placed on the market a mi-

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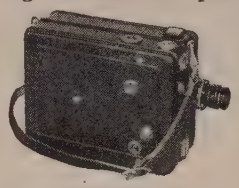
DeVry

The DeVry Corporation, world noted makers of motion picture projectors, announces a new movie camera! At last, a motion picture camera with STANDARD FILM for your own private use! It means real, clear-cut motion pictures in the home. It means you, too, now can take professional motion pictures and show them anywhere—this amazing new camera takes pictures that can be shown in theatres, churches, school houses, every place where you see regular motion pictures—it means motion pictures of your children, friends, picnics, games, travel, the family circle—all the cherished pictures you want to preserve—in full theatre size and theatre clarity any time. And yet, the price is lower than many motion picture cameras made for amateur use that require "off standard," narrow film which professionals do not use. Don't impair your negative by permitting it to be turned into a positive that you can't make clear prints from to give to your relatives and friends.

Amazing Low Price *Only* $150.00



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Think! This wonderful new De Vry weighs only 9 lbs.! And no tripod needed. Three view finders! Handsome, all metal grained leather finished case. Size 8½ x 6½ x 3¾. Accurate, automatic footage meter. Take it anywhere. Operates as easily as still camera. Also an amazing exclusive feature—an action lock that actually lets you get into the scene yourself or direct the action while the camera goes on recording loved figures and scenes for the future.

This is 35*mm* standard size used in all professional cameras and the new DeVry for amateur use. It is the only film that can give you real motion pictures for clear-cut showing and for preservation

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croscope known as the Little Gem which seems to fill the need of the amateur microscopist and which likewise lends itself to a variety of uses in the industrial and educational field. It provides a range of 196 to 5,625 times magnification and is separable, permitting the examination of bulky as well as smaller objects.

Poetry Contest

Having enjoyed marked success with its 1925 contest, the Chattanooga Writers' Club announces its 1926 poetry competition under the Elberta Clark Walker fund established by Robert Sparks Walker. Two prizes are offered of $20 and $10 each. They are open respectively to all entrants and to southern writers for the best Nature poem, original and unpublished, not more than seventy-two lines in length but of unrestricted form. One poem only is allowed each contestant, no manuscripts will be returned and the winning poems become the property of the club. The author's name must not appear on the manuscript but be enclosed in a separate envelope with the address. The contest closes November first of this year and the prizes will be awarded January 1, 1927. The poems should be sent to Miss Jessie E. Turner, 1319 Dodds Avenue, Chattanooga, Tennessee.

New Birds Found

Although the Mason-Spinden Expedition to Yucatan was primarily to discover more about the historic Maya civilization, it has resulted in the discovery of seven new species of birds. The American Museum of Natural History loaned its assistant curator of birds, Mr. Ludlow Griscom, to the expedition and he has brought back two fly-catchers, a rosy ant-tanager, an oriole and two new subspecies of boat-billed heron and reddish egret. One of the most remarkable places visited was Cozumel Island, about twenty miles off the coast. Mr. Griscom confirmed the fact despite its proximity to the mainland, this island has some eighteen kinds of birds not found elsewhere in the world.

An Eccentric Cherry

Frank W. Matz of Mohnton, Pennsylvania, was picking cherries recently, he reports. He came upon a double "ox-heart" cherry, seemingly two cherries grown together on one stem. On opening the fruit he found that it had two seeds.

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Special collection of above:
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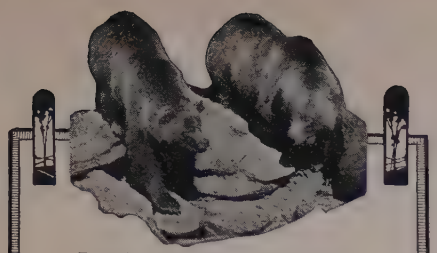

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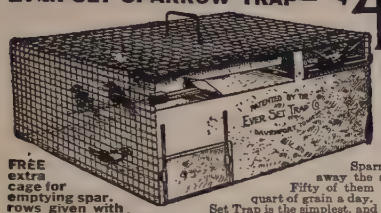

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Remember the Bees

Investigations recently completed by the U. S. Department of Entomology have resulted in urging owners of fruit trees to remember the bees when spraying their trees. Studies show that the bees suffer from the effects of arsenic, not only causing the loss of bees and honey but also seriously affecting the most effective means of pollination carried on by these busy workers. The recommendation is that apple trees be sprayed when ninety per cent of the petals have fallen rather than when the trees are in full bloom.

Beans and Beetles

Bean growers have been beset by another undesirable alien in the person of the Mexican Bean Beetle. It has been particularly active in Pennsylvania and the State Department of Agriculture has gotten out a special bulletin on its control. This is specially for the growers and can be obtained by a request to the Department at Harrisburg for General Bulletin No. 417.

Pity the Hawks

In the United States there are fifty species of hawks and owls. The majority of these have been proved to be mainly or wholly beneficial. Yet a price is virtually upon the feathered heads of all of them, for, to a man with a gun and the lid of the law off, "a hawk is a hawk." There has been a concerted campaign of publicity and advertising against these birds with prizes the goal of quantity killing. Their offenses have been exaggerated without evidence. At the present rate of slaughter we are quite probably letting ourselves in for a plague of mice, and if the farmer prefers that now to hawks he will learn better after he has been through it. A number of distinguished naturalists have banded together to enter a plea for the hawks and owls, and anyone interested in some evidence in the case has only to write to the National Association of Audubon Societies, 1974 Broadway, New York City, and ask for it.

Stars in Florida

There is a variety of stars in Florida in many fields, but Mr. James J. Marshall, Miami attorney and secretary of the Southern Cross Observatory, writes the following that will no doubt be of much interest to our many readers interested in astronomy.

"It may interest you to know," Mr. Marshall writes, "that at Miami, located about 24¾° north latitude, ev-

Millions of Peonies

Near Springfield, Ohio, there are more than 80 acres of Peonies. Each year millions of buds unfold their silken petals and later nod complacently in the sun. There are flowers of the purest white; some of deep maroon, and others with every imaginable combination of these colors.

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are represented in this great collection—the largest Peony fields in the world. Practically all of the best varieties are there: those which win prizes year after year, together with their less costly brethren used to produce brilliant masses of color. Each and every one is a lovely bit of "garden furniture."

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Brand's Peonies awarded Gold and Silver Medals at National Peony Show. Brand's Peonies awarded Grand Sweepstakes at St. Paul Peony Show. Brand's Peonies awarded American Peony Society Medal at Minneapolis Peony Show.

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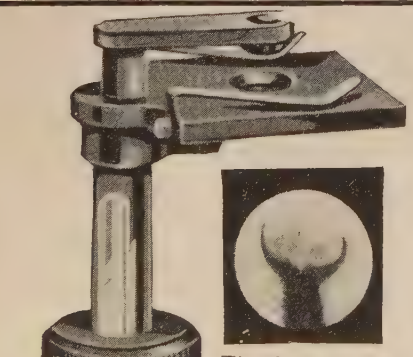

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ery first-magnitude star and fifty-eight of the sixty second-magnitude stars appear above the horizon. Such wonderful celestial objects as the Southern Cross, Canopus, Achernar, Omega Centauri and the whole constellation of Scorpio can be clearly seen. As the region of the sky about the South Pole is comparatively vacant of bright stars or objects of great interest, it appears that, within the geographical limits of the United States, every important object in the sky, with the exception of the Magellanic clouds, can be seen.

"The Southern Cross is considered to be visible only near the equator. Its brightest star, Alpha Crucis, is about 62° south latitude, which brings it two degrees above the Miami horizon and clearly visible on clear moonless evenings. I have seen it innumerable times. In May it is on the meridian at 9.30 p. m. As an asterism of interest, I believe the Southern Cross to be overestimated, as it is much surpassed by Orion, Scorpio or Centaur. The two brilliant stars, Alpha and Beta Centauri, a few degrees to the east, lend much glory to the Cross. These are both more brilliant than Alpha Crucis and are the closest pair of first magnitude stars in the sky.

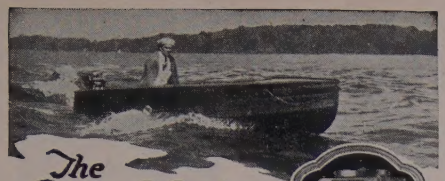
"Canopus is somewhat dimmer than Sirius, but as it lies in a field of dim stars it gives a brighter effect. In this latitude it is well above the horizon for four months in the evening. Achernar is a bright object in a dim field and follows Fomalhaut closely. It sets in the early evening about April 1. Omega Centauri is, in the telescope, the most interesting object in the sky. In a six-inch glass with a low power it will almost fill the field. Resembling a loosely wound ball of yarn, this cluster must compromise a billion suns.

"Scorpio is never appreciated in the north. I doubt whether, in its entirety, it is inferior in splendor to Orion. At Washington, its lower stars are obscured by horizon mists, but the curve of the tail with the closely placed stars of the second magnitude gives a more pleasing and brighter picture than Ursa Major. At Miami it reaches high in the sky on the meridian.

"There is not a star field north of the equator to compare with the area near the boundary of Argo and Centaur. The heavens in this region are sprinkled with myriads of first, second and third magnitude stars, so numerous that they overlap each other in the atlas."

ANSWER TO JULY NATURE PUZZLE:

LOVE THE BIRDS



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Questions and Answers

The American Nature Association will be glad to answer each month such questions as its members ask about Nature.

QUESTION: *Will the bite of any species of skunk cause rabies?*—C. C. E.

ANSWER: There are a few instances on record of the bite of a skunk transmitting rabies. This disease is caused by the bite of an animal which has become inoculated by being bitten by another with the disease. Rabies, probably carried first by dogs, may thus be transmitted by wolves or even cows and horses that have been bitten.

QUESTION: *Is honeysuckle ever poisonous?*—M. L. St. P.

ANSWER: Many plants are called honeysuckle in different parts of the country. The pink azalea, a shrub, is sometimes so called. We can find no record of this having poisonous qualities. Several of the true honeysuckles, *Lonicera,* including the Japanese honeysuckle, *L. Japonica,* a common imported running and climbing vine, contain saponin, a substance which sometimes causes them to be somewhat poisonous to cattle eating the leaves. None of these plants, however, causes any skin irritation or is otherwise harmful to humans.

QUESTION: *What bird builds its nest last?*—G. C. K.

ANSWER: The goldfinch builds its nest latest in the summer. Another species which nests late is the cedar waxwing.

QUESTION: *How long will deer and moose live?*—D. M. P.

ANSWER: Moose reach their full maturity at about seven years and may live to eighteen or twenty years. Deer in general probably live nearly as long.

QUESTION: *I am sending a specimen of what is commonly called a hair snake. Can you tell me about it?*—N. D. W.

ANSWER: It is a "hair snake" more properly called a hair worm, and formerly was supposed by the ignorant to come from a horse hair placed in water. The specimen is an adult. The two sexes pair and eggs are produced. From these hatch the tiny young, scarcely one-twenty-fifth of an inch in length. These burrow into the foot of some water insect and thence to its body. The further development of the worm is said to be contingent upon being swallowed by a fish, after which the worm goes through a change in the intestinal tract and emerges into the water, after an interval of five or six months, in its mature form.

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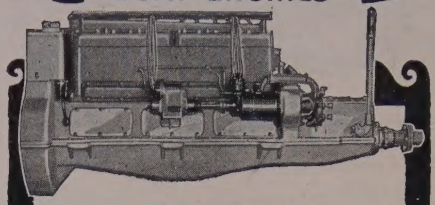

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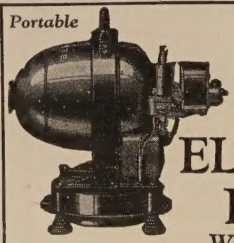

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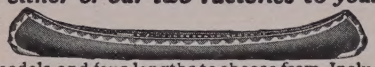

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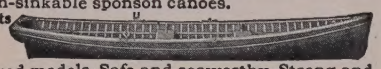

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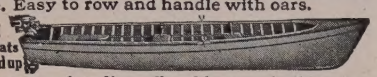

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Aviculturists Please Note

Mr. Charles T. Metzger of 6312 South Ashland Avenue, Chicago, is desirous of getting in touch with individuals interested in keeping and especially breeding foreign birds in cages and aviaries with the object of forming an association or club similar to the Aviculturists Society of England.

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Nature Correspondence

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Dr. F. L. R. Roberts of Spirit Lake, Iowa, has been gathering information on the bird-catching and mouse-catching activities of the cat and is desirous of receiving information and, especially, photographs from observers to assist him in compiling data.

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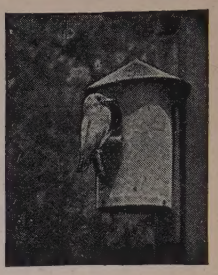

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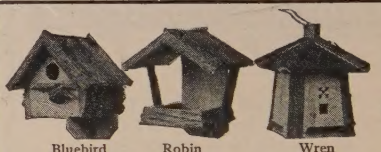

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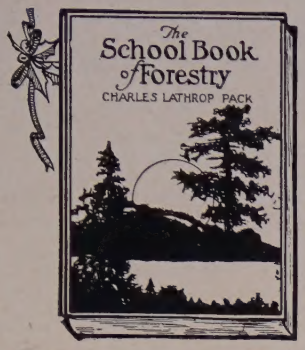

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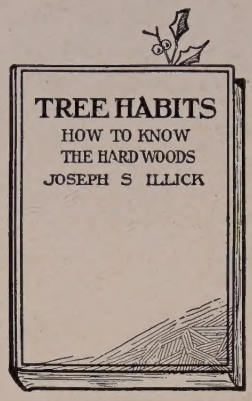

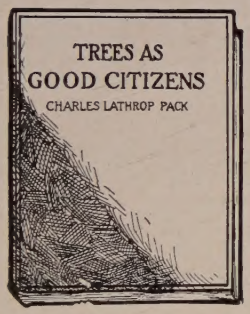

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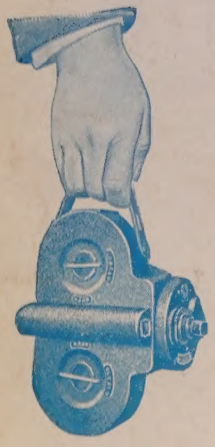

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